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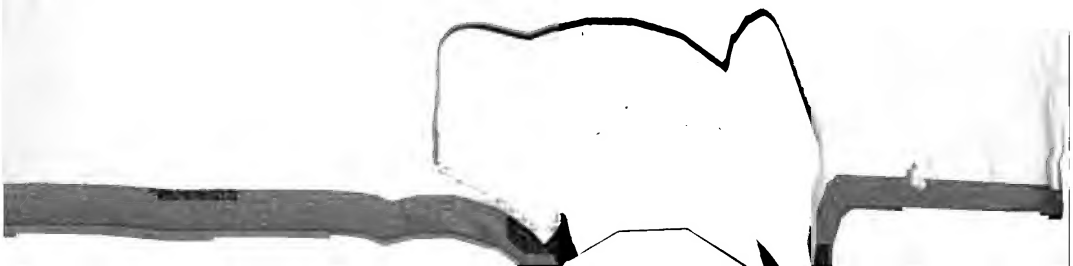

REPORT

OF THE

TESTS OF METALS

AND

OTHER MATERIALS

FOR

INDUSTRIAL PURPOSES

MADE WITH THE

UNITED STATES TESTING MACHINE AT WATERTOWN ARSENAL, MASSACHUSETTS,

DURING

THE FISCAL YEAR ENDED JUNE 30, 1888.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1889.

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LETTER

FROM

THE SECRETARY OF WAR,

TRANSMITTING,

With a letter from the Chief of Ordnance, a report by Lieut. Col. F. H. Parker, commanding the Watertown Arsenal, of tests of iron and steel and other materials for industrial purposes.

DECEMBER 6, 1888.—Referred to the Committee on Appropriations and ordered to be printed.

WAR DEPARTMENT,
Washington City, December 4, 1888.

The Secretary of War has the honor to transmit to the House of Representatives a letter from the Chief of Ordnance, U. S. Army, dated the 22d ultimo, and its accompanying report of Lieut. Col. F. H. Parker, Ordnance Department, U. S. Army, commanding the Watertown Arsenal, of "Tests of iron and steel and other materials for industrial purposes," made with the United States testing machine during the fiscal year ended June 30, 1888.

WM. C. ENDICOTT,
Secretary of War.

The SPEAKER OF THE HOUSE OF REPRESENTATIVES.

ORDNANCE OFFICE, WAR DEPARTMENT,
Washington, D. C., November 22, 1888.

R: I have the honor to submit for transmission to Congress, as re-
red by law, the report of Lieut. Col. F. H. Parker, Ordnance Depart-
nt, commanding Watertown Arsenal, of "Tests of iron, steel, and
er materials for industrial purposes," made with the United States
ing machine during the fiscal year ended June 30, 1888.

Very respectfully, your obedient servant,

S. V. BENÉT,
Brigadier-General, Chief of Ordnance.

e SECRETARY OF WAR.

78

WATERTOWN ARSENAL,
Watertown, Mass., August 31, 1888.

SIR: I have the honor to transmit herewith the annual report of tests of iron, steel, and other materials made at this arsenal with the United States testing machine during the fiscal year ending June 30, 1888.

The total number of specimens tested was 1,671, of which 1,022 were public tests and 649 for private parties.

The receipts and expenditures for the year were as follows:

Testing machine, 1888.

Amount appropriated	$10,000.00
Amount received for private tests	1,035.88
Total received	11,035.88
Expended for services and labor	7,385.22
Expended for power, tools, implements material for repairs and improvements	2,967.85
Deposited to credit of Treasurer of the United States	632.81
Total disbursed	11,035.88

Respectfully, your obedient servant,

F. H. PARKER,
Lieut. Col., Ord. Dept., U. S. A., Commanding.

The CHIEF OF ORDNANCE, U. S. A.,
Washington, D. C.

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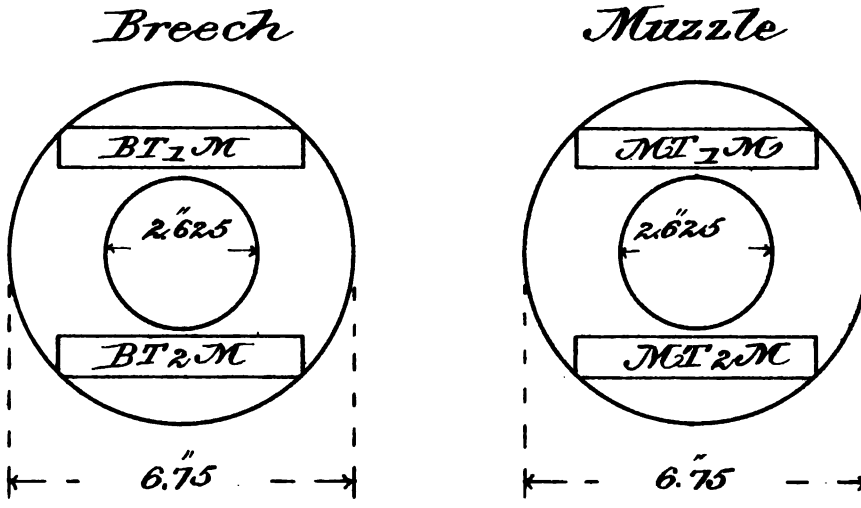
3.2 inch Steel B.L. Rifles.
Tubes.



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TUBES 3.2 INCH RIFLES.

No. 3498.

Marks, $\frac{32\ Rs\ T}{BT,\ M}$
Diameter, ".505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	.....	
2,000	10,000	.000250	.000150	0.	.....	
3,000	15,000	.000400	.000150	0.	.....	
4,000	20,000	.000550	.000150	0.	.....	
5,000	25,000	.000750	.000200	0.	.....	
6,000	30,000	.000950	.000200	0.	.....	
7,000	35,000	.001100	.000150	0.	.....	
8,000	40,000	.001250	.000150	0.	.....	
9,000	45,000	.001450	.000200	.....	.....	
9,200	46,000	.001500	.000050	.....	.....	
9,400	47,000	.001550	.000050	.....	.....	Elastic limit.
9,600	48,000	.001700	.000150	.....	.....	
9,800	49,000	.003250	.001550	.....	.....	
10,000	50,000	.004600	.001350	.....	.....	
10,200	51,000	.005750	.001150	.....	.....	
10,400	52,000	.006800	.001050	.....	.....	
10,600	53,000	.007850	.001050	.....	.....	
10,800	54,000	.008750	.000900	.....	.....	
11,000	55,000	.009800	.001050	.....	.....	
11,200	56,000	.010850	.001050	.....	.....	
11,400	57,000	.011850	.001000	.....	.....	
11,600	58,000	.012900	.001050	.....	.....	
11,800	59,000	.013900	.001000	.....	.....	
12,000	60,000	.015100	.001200	.....	.....	
12,400	62,000	.017250	.002150	.....	.....	
12,800	64,000	.019800	.002550	.....	.....	
13,200	66,000	.022000	.002200	.....	.....	
13,600	68,000	.024850	.002850	.....	.....	
14,000	70,000	.027650	.002800	.....	.....	
14,400	72,000	.031000	.003350	.....	.....	
14,800	74,000	.035000	.004000	.....	.....	
15,200	76,000	.038900	.003900	.....	.....	
15,600	78,000	.043750	.004850	.....	.....	
16,000	80,000	.049750	.006000	.....	.....	
16,400	82,000	.056800	.007050	.....	.....	
16,800	84,000	.0650	.0082	.....	.....	
17,200	86,000	.0850	.0200	.....	.....	
17,600	88,000	.1450	.0600	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	88,000
Elastic limit per square inch of original section	do....	47,000
Elongation per inch after rupture	inch..	0.2550
Elongation per inch under strain at elastic limit	do....	.001550
Reduction in diameter at point of rupture	do....	.135
Reduction in area after rupture, per centum of original section		46.2
Position of rupture		".90 from neck
Character of broken surface		silky
Elongation of inch sections		".16, ".35*

No. 3499.

Marks, $\frac{32\ R_{66}\ T}{B\ T_2\ M}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	.....	
2,000	10,000	.000250	.000150	0.	.....	
3,000	15,000	.000400	.000150	0.	.....	
4,000	20,000	.000600	.000200	0.	.....	
5,000	25,000	.000750	.000150	0.	.....	
6,000	30,000	.000900	.000150	0.	.....	
7,000	35,000	.001100	.000200	0.	.....	
8,000	40,000	.001200	.000100	0.	.....	
9,000	45,000	.001350	.000150	.....	.....	
9,200	46,000	.001400	.000050	.....	.....	
9,400	47,000	.001450	.000050	.....	.....	
9,600	48,000	.001550	.000100	.....	.....	Elastic limit.
9,800	49,000	.002750	.001200	.....	.....	
10,000	50,000	.004300	.001550	.....	.....	
10,200	51,000	.005350	.001050	.....	.....	
10,400	52,000	.006500	.001150	.....	.....	
10,600	53,000	.007250	.000750	.....	.....	
10,800	54,000	.008250	.001000	.....	.....	
11,000	55,000	.009350	.001100	.....	.....	
11,200	56,000	.010100	.000750	.....	.....	
11,400	57,000	.011500	.001400	.....	.....	
11,600	58,000	.012800	.001300	.....	.....	
11,800	59,000	.013900	.001100	.....	.....	
12,000	60,000	.015000	.001100	.....	.....	
12,400	62,000	.017250	.002250	.....	.....	
12,800	64,000	.019500	.002250	.....	.....	
13,200	66,000	.021350	.001850	.....	.....	
13,600	68,000	.024250	.002900	.....	.....	
14,000	70,000	.027000	.002750	.....	.....	
14,400	72,000	.031400	.004400	.....	.....	
14,800	74,000	.034100	.002700	.....	.....	
15,200	76,000	.038250	.004150	.....	.....	
15,600	78,000	.043500	.005250	.....	.....	
16,000	80,000	.049500	.006000	.....	.....	
16,400	82,000	.057500	.008000	.....	.....	
16,800	84,000	.0650	.0075	.....	.....	
17,200	86,000	.0900	.0250	.....	.....	
17,580	87,900	.1500	.0600	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	87,900
Elastic limit per square inch of original section	do....	48,000
Elongation per inch after rupture	inch..	0.2500
Elongation per inch under strain at elastic limit	do....	.001550
Reduction in diameter at point of rupture	do....	.145
Reduction in area after rupture, per centum of original section		49.1
Position of rupture		″.80 from neck
Character of broken surface		silky
Elongation of inch sections		″.35″, ″.15

No. 3500.

Marks, $\frac{32\ R_{63}\ T}{M\ T_1\ M}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	.....	
2,000	10,000	.000250	.000150	0.	.....	
3,000	15,000	.000450	.000200	0.	.....	
4,000	20,000	.000650	.000200	0.	.....	
5,000	25,000	.000800	.000150	0.	.....	
6,000	30,000	.001000	.000200	0.	.....	
7,000	35,000	.001200	.000200	0.	.....	
8,000	40,000	.001350	.000150	0.	.....	
9,000	45,000	.001500	.000150	.....	.....	
9,200	46,000	.001600	.000100	.....	.....	Elastic limit.
9,400	47,000	.002000	.000400	.....	.....	
9,600	48,000	.002750	.000750	.....	.....	
9,800	49,000	.004350	.001600	.....	.....	
10,000	50,000	.005500	.001150	.....	.....	
10,200	51,000	.006250	.000750	.....	.....	
10,400	52,000	.006750	.000500	.....	.....	
10,600	53,000	.007500	.000750	.....	.....	
10,800	54,000	.008500	.001000	.....	.....	
11,000	55,000	.009500	.001000	.....	.....	
11,200	56,000	.010350	.000850	.....	.....	
11,400	57,000	.011250	.000900	.....	.....	
11,600	58,000	.012250	.001000	.....	.....	
11,800	59,000	.013250	.001000	.....	.....	
12,000	60,000	.014400	.001150	.....	.....	
12,400	62,000	.016350	.001950	.....	.....	
12,800	64,000	.018750	.002400	.....	.....	
13,200	66,000	.021250	.002500	.....	.....	
13,600	68,000	.023150	.001900	.....	.....	
14,000	70,000	.026300	.003150	.....	.....	
14,400	72,000	.029500	.003200	.....	.....	
14,800	74,000	.032600	.003100	.....	.....	
15,200	76,000	.036500	.003900	.....	.....	
15,600	78,000	.041050	.004550	.....	.....	
16,000	80,000	.046750	.005700	.....	.....	
16,400	82,000	.053500	.006750	.....	.....	
16,800	84,000	.0600	.0065	.....	.....	
17,200	86,000	.0750	.0150	.....	.....	
17,600	88,000	.1000	.0250	.....	.....	
17,830	89,150	.1450	.0450	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds	89,150
Elastic limit per square inch of original section	do	46,000
Elongation per inch after rupture	inch	0.2300
Elongation per inch under strain at elastic limit	do	.001600
Reduction in diameter at point of rupture	do	.125
Reduction in area after rupture, per centum of original section		43.3
Position of rupture		″.50 from neck
Character of broken surface		silky
Elongation of inch sections		″.14, ″.32*

No. 3501.

Marks, $\frac{32\ \text{Res T}}{\text{M T, M}}$
Diameter, ″.505.
Sectional area, ″.20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	.....	
2,000	10,000	.000250	.000150	0.	.....	
3,000	15,000	.000450	.000200	0.	.....	
4,000	20,000	.000650	.000200	0.	.....	
5,000	25,000	.000800	.000150	0.	.....	
6,000	30,000	.000950	.000150	0.	.....	
7,000	35,000	.001200	.000250	0.	.....	
8,000	40,000	.001350	.000150	0.	.....	
9,000	45,000	.001550	.000200	.....	.....	
9,200	46,000	.001650	.000100	.....	.....	Elastic limit.
9,400	47,000	.001850	.000200	.....	.....	
9,600	48,000	.002550	.000700	.....	.....	
9,800	49,000	.003650	.001100	.....	.....	
10,000	50,000	.004650	.000950	.....	.....	
10,200	51,000	.005400	.000800	.....	.....	
10,400	52,000	.006250	.000850	.....	.....	
10,600	53,000	.007100	.000850	.....	.....	
10,800	54,000	.008050	.000950	.....	.....	
11,000	55,000	.008750	.000700	.....	.....	
11,200	56,000	.009750	.001000	.....	.....	
11,400	57,000	.010750	.001000	.....	.....	
11,600	58,000	.011750	.001000	.....	.....	
11,800	59,000	.012500	.000750	.....	.....	
12,000	60,000	.013500	.001000	.....	.....	
12,400	62,000	.015750	.002250	.....	.....	
12,800	64,000	.017750	.002000	.....	.....	
13,200	66,000	.019700	.001950	.....	.....	
13,600	68,000	.022400	.002700	.....	.....	
14,000	70,000	.025500	.003100	.....	.....	
14,400	72,000	.029000	.003500	.....	.....	
14,800	74,000	.031750	.002750	.....	.....	
15,200	76,000	.035000	.003250	.....	.....	
15,600	78,000	.038500	.003500	.....	.....	
16,000	80,000	.044250	.005750	.....	.....	
16,400	82,000	.051000	.006750	.....	.....	
16,800	84,000	.058250	.007250	.....	.....	
17,200	86,000	.0650	.006750	.....	.....	
17,600	88,000	.0900	.0250	.....	.....	
17,750	88,750	.1150	.0250	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds	88,750
Elastic limit per square inch of original section	do	46,000
Elongation per inch after rupture	inch	0.2050
Elongation per inch under strain at elastic limit	do	.001650
Reduction in diameter at point of rupture	do	.125
Reduction in area after rupture, per centum of original section		43.3
Position of rupture		″.10 from middle of stem
Character of broken surface		silky
Elongation of inch sections		″.18, ″.23*

No. 3490.

Marks, $\frac{32\,R_{\nu}\,T}{B\,T_1\,M}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000150	.000150	0.	.....	
2,000	10,000	.000300	.000150	0.	.....	
3,000	15,000	.000500	.000200	0.	.....	
4,000	20,000	.000650	.000150	0.	.....	
5,000	25,000	.000850	.000200	0.	.....	
6,000	30,000	.001000	.000150	0.	.....	
7,000	35,000	.001200	.000200	0.	.....	
8,000	40,000	.001400	.000200	0.	.....	
8,200	41,000	.001450	.000050	.....	.....	
8,400	42,000	.001500	.000050	.....	.....	
8,600	43,000	.001500	0.	.....	.....	
8,800	44,000	.001600	.000100	.....	.....	Elastic limit.
9,000	45,000	.004100	.002500	.....	.....	
9,200	46,000	.006550	.002450	.....	.....	
9,400	47,000	.007350	.000800	.....	.....	
9,600	48,000	.008100	.000750	.....	.....	
9,800	49,000	.008750	.000650	.....	.....	
10,000	50,000	.009600	.000850	.....	.....	
10,400	52,000	.011400	.001800	.....	.....	
10,800	54,000	.013400	.002000	.....	.....	
11,200	56,000	.015350	.001950	.....	.....	
11,600	58,000	.017350	.002000	.....	.....	
12,000	60,000	.019650	.002300	.....	.....	
12,400	62,000	.022000	.002350	.....	.....	
12,800	64,000	.024600	.002600	.....	.....	
13,200	66,000	.027400	.002800	.....	.....	
13,600	68,000	.030600	.003200	.....	.....	
14,000	70,000	.034000	.003400	.....	.....	
14,400	72,000	.037850	.003850	.....	.....	
14,800	74,000	.042550	.004700	.....	.....	
15,200	76,000	.048500	.004950	.....	.....	
15,600	78,000	.0540	.0055	.....	.....	
16,000	80,000	.0600	.0060	.....	.....	
16,400	82,000	.0800	.0200	.....	.....	
16,800	84,000	.0950	.0150	.....	.....	
17,120	85,600	.1500	.0550	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	85,600
Elastic limit per square inch of original section	do....	44,000
Elongation per inch after rupture	inch..	0.2450
Elongation per inch under strain at elastic limit	do....	.001600
Reduction in diameter at point of rupture	do....	.115
Reduction in area after rupture, per centum of original section		40.3
Position of rupture		1″ from neck
Character of broken surface		silky
Elongation of inch sections		″.29*, ″.20

No. 3491.

Marks, $\frac{32\ R_{67}\ T}{B\ T_2\ M}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000150	.000150	0.	.....	
2,000	10,000	.000350	.000200	0.	.....	
3,000	15,000	.000500	.000150	0.	.....	
4,000	20,000	.000700	.000200	0.	.....	
5,000	25,000	.000800	.000100	0.	.....	
6,000	30,000	.001000	.000200	0.	.....	
7,000	35,000	.001150	.000150	0.	.....	
8,000	40,000	.001350	.000200	0.	.....	
8,200	41,000	.001400	.000050	.....	.....	
8,400	42,000	.001450	.000050	.....	.....	
8,600	43,000	.001450	0.	.....	.....	
8,800	44,000	.001500	.000050	.....	.....	
9,000	45,000	.001550	.000050	.....	.....	
9,200	46,000	.001550	0.	.....	.....	Elastic limit.
9,400	47,000	.005400	.003850	.....	.....	
9,600	48,000	.006500	.001100	.....	.....	
9,800	49,000	.007250	.000750	.....	.....	
10,000	50,000	.008050	.000800	.....	.....	
10,200	51,000	.008900	.000850	.....	.....	
10,400	52,000	.009750	.000850	.....	.....	
10,800	54,000	.011550	.001800	.....	.....	
11,200	56,000	.013500	.001950	.....	.....	
11,600	58,000	.015500	.002000	.....	.....	
12,000	60,000	.017700	.002200	.....	.....	
12,400	62,000	.020000	.002300	.....	.....	
12,800	64,000	.022250	.002250	.....	.....	
13,200	66,000	.024600	.002350	.....	.....	
13,600	68,000	.027550	.002950	.....	.....	
14,000	70,000	.030600	.003050	.....	.....	
14,400	72,000	.034350	.003750	.....	.....	
14,800	74,000	.038500	.004150	.....	.....	
15,200	76,000	.043500	.005000	.....	.....	
15,600	78,000	.048500	.005000	.....	.....	
16,000	80,000	.056000	.007500	.....	.....	
16,400	82,000	.0675	.0115	.....	.....	
16,800	84,000	.0800	.0125	.....	.....	
17,200	86,000	.1050	.0250	.....	.....	
17,400	87,000	.1500	.0450	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	87,000
Elastic limit per square inch of original section	do....	46,000
Elongation per inch after rupture	inch..	0.2400
Elongation per inch under strain at elastic limit	do....	.001550
Reduction in diameter at point of rupture	do....	.123
Reduction in area after rupture, per centum of original section		43.5
Position of rupture		″.70 from neck
Character of broken surface		silky
Elongation of inch sections		″.12, ″.36*

No. 3492.

Marks, $\frac{32\ R_{\text{w}}\ T}{M\ T_1\ M}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000150	.000150	0.	.....	
2,000	10,000	.000300	.000150	0.	.....	
3,000	15,000	.000500	.000200	0.	.....	
4,000	20,000	.000650	.000150	0.	.....	
5,000	25,000	.000850	.000200	0.	.....	
6,000	30,000	.001000	.000150	0.	.....	
7,000	35,000	.001150	.000150	0.	.....	
8,000	40,000	.001350	.000200	0.	.....	
9,000	45,000	.001550	.000200	.....	.....	
9,200	46,000	.001600	.000050	.....	.....	
9,400	47,000	.001700	.000100	.....	.....	Elastic limit.
9,600	48,000	.002550	.000850	.....	.....	
9,800	49,000	.003600	.001050	.....	.....	
10,000	50,000	.004750	.001150	.....	.....	
10,200	51,000	.006100	.001350	.....	.....	
10,400	52,000	.007250	.001150	.....	.....	
10,800	54,000	.008850	.001600	.....	.....	
11,200	56,000	.010650	.001800	.....	.....	
11,600	58,000	.012400	.001750	.....	.....	
12,000	60,000	.014500	.002100	.....	.....	
12,400	62,000	.017000	.002500	.....	.....	
12,800	64,000	.018800	.001800	.....	.....	
13,200	66,000	.020600	.001800	.....	.....	
13,600	68,000	.023000	.002400	.....	.....	
14,000	70,000	.025650	.002650	.....	.....	
14,400	72,000	.029000	.003350	.....	.....	
14,800	74,000	.032250	.003250	.....	.....	
15,200	76,000	.035500	.003250	.....	.....	
15,600	78,000	.039500	.004000	.....	.....	
16,000	80,000	.044150	.004650	.....	.....	
16,400	82,000	.050000	.005850	.....	.....	
16,800	84,000	.057500	.007500	.....	.....	
17,200	86,000	.0650	.0075	.....	.....	
17,600	88,000	.0850	.0200	.....	.....	
17,900	88,950	.1350	.0500	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	89,950
Elastic limit per square inch of original section	do....	47,000
Elongation per inch after rupture	inch..	0.1850
Elongation per inch under strain at elastic limit	do....	.001700
Reduction in diameter at point of rupture	do....	.055
Reduction in area after rupture, per centum of original section		20.5
Position of rupture		″.20 from neck
Character of broken surface		granular; dull spot at the circumference
Elongation of inch sections		″.24,* ″.13
Diameter ¼″ from point of rupture		″.43

No. 3493.

Marks, $\frac{32\ R_W\ T}{M\ T_3\ M}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	.....	
2,000	10,000	.000300	.000200	0.	.....	
3,000	15,000	.000450	.000150	0.	.....	
4,000	20,000	.000650	.000200	0.	.....	
5,000	25,000	.000850	.000200	0.	.....	
6,000	30,000	.001000	.000150	0.	.....	
7,000	35,000	.001150	.000150	0.	.....	
8,000	40,000	.001350	.000200	0.	.....	
9,000	45,000	.001500	.000150	.....	.....	
9,200	46,000	.001550	.000050	.....	.....	Elastic limit.
9,400	47,000	.003200	.001650	.....	.....	
9,600	48,000	.004000	.000800	.....	.....	
9,800	49,000	.005250	.001250	.....	.....	
10,000	50,000	.006800	.001550	.....	.....	
10,200	51,000	.007750	.000950	.....	.....	
10,400	52,000	.008550	.000800	.....	.....	
10,600	53,000	.009400	.000850	.....	.....	
10,800	54,000	.010150	.000750	.....	.....	
11,200	56,000	.012000	.001850	.....	.....	
11,600	58,000	.014000	.002000	.....	.....	
12,000	60,000	.016000	.002000	.....	.....	
12,400	62,000	.018050	.002050	.....	.....	
12,800	64,000	.020300	.002250	.....	.....	
13,200	66,000	.022550	.002250	.....	.....	
13,600	68,000	.025250	.002700	.....	.....	
14,000	70,000	.028000	.002750	.....	.....	
14,400	72,000	.031250	.003250	.....	.....	
14,800	74,000	.034750	.003500	.....	.....	
15,200	76,000	.039000	.004250	.....	.....	
15,600	78,000	.043500	.004500	.....	.....	
16,000	80,000	.049250	.005750	.....	.....	
16,400	82,000	.056000	.006750	.....	.....	
16,800	84,000	.0600	.0040	.....	.....	
17,200	86,000	.0800	.0200	.....	.....	
17,600	88,000	.1050	.0250	.....	.....	
17,800	89,000	.1450	.0400	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	89,000
Elastic limit per square inch of original section	do....	46,000
Elongation per inch after rupture	inch..	0.2350
Elongation per inch under strain at elastic limit	do....	.001550
Reduction in diameter at point of rupture	do....	.115
Reduction in area after rupture, per centum of original section		40.3
Position of rupture		″.40 from neck
Character of broken surface		granular, 40 per cent.; silky serrated, 60 per cent.
Elongation of inch sections		″.31*, ″.16

No. 3536.

Marks, $\frac{22\ R_{87}\ T}{M\ T_1\ M}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	.....	
2,000	10,000	.000300	.000200	0.	.....	
3,000	15,000	.000500	.000200	0.	.....	
4,000	20,000	.000650	.000150	0.	.....	
5,000	25,000	.000800	.000150	0.	.....	
6,000	30,000	.000950	.000150	0.	.....	
7,000	35,000	.001150	.000200	0.	.....	
8,000	40,000	.001300	.000150	0.	.....	
9,000	45,000	.001450	.000150	.....	.....	Elastic limit.
9,200	46,000	.001800	.000350	.....	.....	
9,400	47,000	.002500	.000700	.....	.....	
9,600	48,000	.003600	.001100	.....	.....	
9,800	49,000	.004900	.001300	.....	.....	
10,000	50,000	.006400	.001500	.....	.....	
10,200	51,000	.007500	.001100	.....	.....	
10,400	52,000	.008500	.001000	.....	.....	
10,800	54,000	.009900	.001400	.....	.....	
11,200	56,000	.011500	.001600	.....	.....	
11,600	58,000	.014000	.002500	.....	.....	
12,000	60,000	.015750	.001750	.....	.....	
12,400	62,000	.017350	.001600	.....	.....	
12,800	64,000	.019350	.002000	.....	.....	
13,200	66,000	.022000	.002650	.....	.....	
13,600	68,000	.024750	.002750	.....	.....	
14,000	70,000	.027000	.002250	.....	.....	
14,400	72,000	.029750	.002750	.....	.....	
14,800	74,000	.033300	.003550	.....	.....	
15,200	76,000	.037050	.003750	.....	.....	
15,600	78,000	.040350	.003300	.....	.....	
16,000	80,000	.045150	.004800	.....	.....	
16,400	82,000	.050900	.005750	.....	.....	
16,800	84,000	.058400	.007500	.....	.....	
17,200	86,000	.0650	.0066	.....	.....	
17,600	88,000	.0850	.0200	.....	.....	
18,000	90,000	.1050	.0200	.....	.....	
18,220	91,100	.1500	.0450	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	91,100
Elastic limit per square inch of original section	do....	45,000
Elongation per inch after rupture	inch..	0.1850
Elongation per inch under strain at elastic limit	do....	.001450
Reduction in diameter at point of rupture	do....	.065
Reduction in area after rupture, per centum of original section		23.9
Position of rupture		″.50 from neck
Character of broken surface	granular, 60 per cent.; dull, flaky, 40 per cent.	
Elongation of inch sections		″.19*, ″.18

No. 3537.

Marks, $\frac{32}{M}\frac{R_w}{T_1}\frac{T}{M}$
Diameter, ".505,
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000150	.000150	0.	.....	
2,000	10,000	.000300	.000150	0.	.....	
3,000	15,000	.000450	.000150	0.	.....	
4,000	20,000	.000550	.000100	0.	.....	
5,000	25,000	.000700	.000150	0,	.....	
6,000	30,000	.000900	.000200	0.	.....	
7,000	35,000	.001050	.000150	0.	.....	
8,000	40,000	.001200	.000150	0.	.....	
9,000	45,000	.001400	.000200	.....	.....	
9,200	46,000	.001450	.000050	.....	.....	Elastic limit.
9,400	47,000	.001600	.000150	.....	.....	
9,600	48,000	.001750	.000150	.....	.....	
9,800	49,000	.002500	.000750	.....	.....	
10,000	50,000	.003250	.000750	.....	.....	
10,200	51,000	.004250	.001000	.....	.....	
10,400	52,000	.006100	.001850	.....	.....	
10,600	53,000	.007100	.001000	.....	.....	
10,800	54,000	.007900	.000800	.....	.....	
11,000	55,000	.008750	.000850	.....	.....	
11,200	56,000	.009600	.000850	.....	.....	
11,600	58,000	.011650	.002050	.....	.....	
12,000	60,000	.013900	.002250	.....	.....	
12,400	62,000	.015750	.001850	.....	.....	
12,800	64,000	.017650	.001900	.....	.....	
13,200	66,000	.019850	.002200	.....	.....	
13,600	68,000	.022050	.002200	.....	.....	
14,000	70,000	.024900	.002850	.....	.....	
14,400	72,000	.027600	.002700	.....	.....	
14,800	74,000	.030600	.003000	.....	.....	
15,200	76,000	.034500	.003900	.....	.....	
15,600	78,000	.037900	.003400	.....	.....	
16,000	80,000	.042750	.004850	.....	.....	
16,400	82,000	.048250	.005500	.....	.....	
16,800	84,000	.055500	.007250	.....	.....	
17,200	86,000	.064250	.008750	.....	.....	
17,600	88,000	.0850	.020750	.....	.....	
18,000	90,000	.1050	.0200	.....	.....	
18,130	90,650	.1400	.0350	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	90,650
Elastic limit per square inch of original section	do....	46,000
Elongation per inch after rupture	inch..	0.2400
Elongation per inch under strain at elastic limit	do....	.001450
Reduction in diameter at point of rupture	do....	.135
Reduction in area after rupture, per centum of original section		46.2
Position of rupture		".60 from neck
Character of broken surface		silky
Elongation of inch sections		".15, ".33"

No. 3555.

Marks, $\frac{32\ R_{\text{or}}\ T}{M\ T_s\ M}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	.....	
2,000	10,000	.000300	.000200	0.	.....	
3,000	15,000	.000450	.000150	0.	.....	
4,000	20,000	.000600	.000150	0.	.....	
5,000	25,000	.000750	.000150	0.	.....	
6,000	30,000	.000900	.000150	0.	.....	
7,000	35,000	.001050	.000150	0.	.....	
8,000	40,000	.001250	.000200	0.	.....	
9,000	45,000	.001400	.000150	.....	.....	
9,200	46,000	.001450	.000050	.....	.....	Elastic limit.
9,400	47,000	.003250	.001800	.....	.....	
9,600	48,000	.005200	.001950	.....	.....	
9,800	49,000	.006450	.001250	.....	.....	
10,000	50,000	.007000	.000550	.....	.....	
10,200	51,000	.007700	.000700	.....	.....	
10,400	52,000	.008500	.000800	.....	.....	
10,600	53,000	.009350	.000850	.....	.....	
10,800	54,000	.010250	.000900	.....	.....	
11,200	56,000	.012000	.001750	.....	.....	
11,600	58,000	.014350	.002350	.....	.....	
12,000	60,000	.016550	.002200	.....	.....	
12,400	62,000	.018600	.002050	.....	.....	
12,800	64,000	.020350	.001750	.....	.....	
13,200	66,000	.022650	.002300	.....	.....	
13,600	68,000	.025050	.002400	.....	.....	
14,000	70,000	.027550	.002500	.....	.....	
14,400	72,000	.030100	.002550	.....	.....	
14,800	74,000	.033500	.003400	.....	.....	
15,200	76,000	.037000	.003500	.....	.....	
15,600	78,000	.041000	.004000	.....	.....	
16,000	80,000	.046350	.005350	.....	.....	
16,400	82,000	.052300	.005950	.....	.....	
16,800	84,000	.059500	.007200	.....	.....	
17,200	86,000	.0650	.0055	.....	.....	
17,600	88,000	.0900	.0250	.....	.....	
18,000	90,000	.1100	.0200	.....	.....	
18,140	90,700	.1450	.0350	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	90,700
Elastic limit per square inch of original section	do....	46,000
Elongation per inch after rupture	inch..	0.2600
Elongation per inch under strain at elastic limit	do....	.001450
Reduction in diameter at point of rupture	do....	.125
Reduction in area after rupture, per centum of original section		43.3
Position of rupture		1″.15 inch from neck
Character of broken surface		silky
Elongation of inch sections		″.30+, ″.22

No. 3556.

Marks, $\frac{32\,R_{27}\,T}{M\,T_6\,M}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000150	.000150	0.	.....	
2,000	10,000	.000300	.000150	0.	.....	
3,000	15,000	.000500	.000200	0.	.....	
4,000	20,000	.000650	.000150	0.	.....	
5,000	25,000	.000850	.000200	0.	.....	
6,000	30,000	.001000	.000150	0.	.....	
7,000	35,000	.001150	.000150	0.	.....	
8,000	40,000	.001350	.000200	0.	.....	
9,000	45,000	.001500	.000150	.....	.....	
9,200	46,000	.001550	.000050	.....	.....	
9,400	47,000	.001600	.000050	.....	.....	
9,600	48,000	.001650	.000050	.....	.....	Elastic limit.
9,800	49,000	.001800	.000150	.....	.....	
10,000	50,000	.002000	.000200	.....	.....	
10,200	51,000	.002550	.000550	.....	.....	
10,400	52,000	.003250	.000700	.....	.....	
10,600	53,000	.005000	.001750	.....	.....	
10,800	54,000	.006150	.001150	.....	.....	
11,000	55,000	.007200	.001050	.....	.....	
11,200	56,000	.008050	.000850	.....	.....	
11,600	58,000	.010350	.002300	.....	.....	
12,000	60,000	.012700	.002350	.....	.....	
12,400	62,000	.014150	.001450	.....	.....	
12,800	64,000	.015850	.001700	.....	.....	
13,200	66,000	.018000	.002150	.....	.....	
13,600	68,000	.020350	.002350	.....	.....	
14,000	70,000	.023100	.002750	.....	.....	
14,400	72,000	.026400	.003300	.....	.....	
14,800	74,000	.028650	.002250	.....	.....	
15,200	76,000	.031500	.002850	.....	.....	
15,600	78,000	.036000	.004500	.....	.....	
16,000	80,000	.040750	.004750	.....	.....	
16,400	82,000	.046500	.005750	.....	.....	
16,800	84,000	.052000	.005500	.....	.....	
17,200	86,000	.057750	.005750	.....	.....	
17,600	88,000	.0685	.010750	.....	.....	
18,000	90,000	.0900	.0215	.....	.....	
18,280	91,400	.1350	.0450	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds	91,400
Elastic limit per square inch of original section	do	48,000
Elongation per inch after rupture	inch	0.2200
Elongation per inch under strain at elastic limit	do	.001650
Reduction in diameter at point of rupture	do	.125
Reduction in area after rupture, per centum of original section		43.3
Position of rupture		″.60 from neck
Character of broken surface		silky
Elongation of inch sections		″.32*, ″.12

No. 3430.

Marks, $\frac{32\ Rs\ T}{B\ T_1\ M}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.		
2,000	10,000	.000250	.000150	0.		
3,000	15,000	.000400	.000150	0.		
4,000	20,000	.000600	.000200	0.		
5,000	25,000	.000750	.000150	0.		
6,000	30,000	.000900	.000150	0.		
7,000	35,000	.001100	.000200	0.		
8,000	40,000	.001250	.000150	0.		
9,000	45,000	.001450	.000200			Elastic limit.
9,200	46,000	.001900	.000450			
9,400	47,000	.004000	.002100			
9,600	48,000	.005000	.001000			
9,800	49,000	.006000	.001000			
10,000	50,000	.006900	.000900			
10,200	51,000	.007650	.000750			
10,400	52,000	.008400	.000750			
10,800	54,000	.010300	.001900			
11,200	56,000	.012000	.001700			
11,600	58,000	.013750	.001750			
12,000	60,000	.016200	.002450			
12,400	62,000	.018500	.002300			
12,800	64,000	.020650	.002150			
13,200	66,000	.023250	.002600			
13,600	68,000	.026750	.002500			
14,000	70,000	.029500	.002750			
14,400	72,000	.031750	.003250			
14,800	74,000	.034900	.003150			
15,200	76,000	.039000	.004100			
15,600	78,000	.043750	.004750			
16,000	80,000	.049250	.005500			
16,400	82,000	.056000	.006750			
16,800	84,000	.0625	.0065			
17,200	86,000	.0850	.0225			
17,600	88,000	.1050	.0200			
17,940	89,700	.1400	.0350			Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	89,700
Elastic limit per square inch of original section	do....	45,000
Elongation per inch after rupture	inch..	0.2300
Elongation per inch under strain at elastic limit	do....	.001450
Reduction in diameter at point of rupture	do....	.125
Reduction in area after rupture, per centum of original section		43.3
Position of rupture		1″ from neck
Character of broken surface		silky
Elongation of inch sections		″.16, ″.30*

No. 3431.

Marks, $\frac{32\ R_{88}\ T}{B\ T_2\ M}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000150	.000150	0.	.....	
2,000	10,000	.000300	.000150	0.	.....	
3,000	15,000	.000500	.000200	0.	.....	
4,000	20,000	.000700	.000200	0.	.....	
5,000	25,000	.000850	.000150	0.	.....	
6,000	30,000	.001000	.000150	0.	.....	
7,000	35,000	.001200	.000200	0.	.....	
8,000	40,000	.001350	.000150	0.	.....	
9,000	45,000	.001500	.000150	.....	.....	
9,200	46,000	.001550	.000050	.....	.....	Elastic limit.
9,400	47,000	.004550	.003000	.....	.....	
9,600	48,000	.005500	.000950	.....	.....	
9,800	49,000	.006250	.000750	.....	.....	
10,000	50,000	.007100	.000850	.....	.....	
10,200	51,000	.007900	.000800	.....	.....	
10,400	52,000	.008900	.001000	.....	.....	
10,800	54,000	.010750	.001850	.....	.....	
11,200	56,000	.012550	.001800	.....	.....	
11,600	58,000	.014500	.001950	.....	.....	
12,000	60,000	.016550	.002050	.....	.....	
12,400	62,000	.018750	.002200	.....	.....	
12,800	64,000	.021000	.002250	.....	.....	
13,200	66,000	.023600	.002600	.....	.....	
13,600	68,000	.026400	.002800	.....	.....	
14,000	70,000	.029550	.003150	.....	.....	
14,400	72,000	.032900	.003350	.....	.....	
14,800	74,000	.036500	.003600	.....	.....	
15,200	76,000	.041000	.004500	.....	.....	
15,600	78,000	.046400	.005400	.....	.....	
16,000	80,000	.053000	.006600	.....	.....	
16,400	82,000	.061000	.008000	.....	.....	
16,800	84,000	.0700	.0090	.....	.....	
17,200	86,000	.0950	.0250	.....	.....	
17,470	87,350	.1400	.0450	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	87,350
Elastic limit per square inch of original section	do....	46,000
Elongation per inch after rupture	inch..	0.2250
Elongation per inch under strain at elastic limit	do....	.001550
Reduction in diameter at point of rupture	do....	.125
Reduction in area after rupture, per centum of original section		43.3
Position of rupture		″.65 from neck
Character of broken surface		silky
Elongation of inch sections		″.32*, ″.13

No. 3432.

Marks, $\frac{32\ R\ 28\ T}{M\ T,\ M}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000150	.000150	0.	.....	
2,000	10,000	.000300	.000150	0.	.....	
3,000	15,000	.000500	.000200	0.	.....	
4,000	20,000	.000700	.000200	0.	.....	
5,000	25,000	.000850	.000150	0.	.....	
6,000	30,000	.001000	.000150	0.	.....	
7,000	35,000	.001200	.000200	0.	.....	
8,000	40,000	.001350	.000150	0.	.....	
9,000	45,000	.001500	.000150	.....	.....	
9,200	46,000	.001550	.000050	.....	.....	Elastic limit.
9,400	47,000	.001950	.000400	.....	.....	
9,600	48,000	.002450	.000500	.....	.....	
9,800	49,000	.003900	.001450	.....	.....	
10,000	50,000	.005150	.001250	.....	.....	
10,200	51,000	.006100	.000950	.....	.....	
10,400	52,000	.007000	.000900	.....	.....	
10,800	54,000	.008500	.001500	.....	.....	
11,200	56,000	.010100	.001600	.....	.....	
11,600	58,000	.012000	.001900	.....	.....	
12,000	60,000	.014000	.002000	.....	.....	
12,400	62,000	.015850	.001850	.....	.....	
12,800	64,000	.017850	.002000	.....	.....	
13,200	66,000	.019900	.002050	.....	.....	
13,600	68,000	.022250	.002350	.....	.....	
14,000	70,000	.024800	.002550	.....	.....	
14,400	72,000	.027650	.002850	.....	.....	
14,800	74,000	.030600	.002950	.....	.....	
15,200	76,000	.033750	.003150	.....	.....	
15,600	78,000	.037400	.003650	.....	.....	
16,000	80,000	.041650	.004250	.....	.....	
16,400	82,000	.047000	.005350	.....	.....	
16,800	84,000	.053250	.006250	.....	.....	
17,200	86,000	.0600	.006750	.....	.....	
17,600	88,000	.0750	.0150	.....	.....	
18,000	90,000	.0950	.0200	.....	.....	
18,220	91,100	.1450	.0500	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	91,100
Elastic limit per square inch of original section	do....	46,000
Elongation per inch after rupture	inch..	0.2100
Elongation per inch under strain at elastic limit	do....	.001550
Reduction in diameter at point of rupture	do....	.125
Reduction in area after rupture, per centum of original section	.....	43.3
Position of rupture		″.50 from neck
Character of broken surface		silky
Elongation of inch sections		″.11, ″.31,*

No. 3433.

Marks, $\frac{32\ R_{28}\ T}{M\ T_2\ M}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	.....	
2,000	10,000	.000300	.000200	0.	.....	
3,000	15,000	.000450	.000150	0.	.....	
4,000	20,000	.000650	.000200	0.	.....	
5,000	25,000	.000850	.000200	0.	.....	
6,000	30,000	.001000	.000150	0.	.....	
7,000	35,000	.001200	.000200	0.	.....	
8,000	40,000	.001400	.000200	0.	.....	
8,200	41,000	.001450	.000050	.....	.....	
8,400	42,000	.001500	.000050	.....	.....	
8,600	43,000	.001500	0.	.....	.....	
8,800	44,000	.001550	.000050	.....	.....	Elastic limit.
9,000	45,000	.001850	.000300	.....	.....	
9,200	46,000	.003050	.001200	.....	.....	
9,400	47,000	.004850	.001800	.....	.....	
9,600	48,000	.006250	.001400	.....	.....	
9,800	49,000	.007150	.000900	.....	.....	
10,000	50,000	.008250	.001100	.....	.....	
10,200	51,000	.009200	.000950	.....	.....	
10,400	52,000	.009750	.000550	.....	.....	
10,800	54,000	.011000	.001250	.....	.....	
11,200	56,000	.012550	.001550	.....	.....	
11,600	58,000	.015000	.002450	.....	.....	
12,000	60,000	.017000	.002000	.....	.....	
12,400	62,000	.019000	.002000	.....	.....	
12,800	64,000	.021000	.002000	.....	.....	
13,200	66,000	.023400	.002400	.....	.....	
13,600	68,000	.025900	.002500	.....	.....	
14,000	70,000	.028750	.002850	.....	.....	
14,400	72,000	.032050	.003300	.....	.....	
14,800	74,000	.035850	.003800	.....	.....	
15,200	76,000	.039900	.004050	.....	.....	
15,600	78,000	.044750	.004850	.....	.....	
16,000	80,000	.050500	.005750	.....	.....	
16,400	82,000	.0575	.0070	.....	.....	
16,800	84,000	.0650	.0075	.....	.....	
17,200	86,000	.0900	.0250	.....	.....	
17,600	88,000	.1100	.0200	.....	.....	
17,640	88,200	.1450	.0350	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	88,200
Elastic limit per square inch of original section	do....	44,000
Elongation per inch after rupture	inch..	0.2350
Elongation per inch under strain at elastic limit	do....	.001550
Reduction in diameter at point of rupture	do....	.135
Reduction in area after rupture, per centum of original section		46.2
Position of rupture		″.65 from neck
Character of broken surface		silky
Elongation of inch sections		″.12, ″.35*

No. 3551.

Marks, $\frac{\text{SS R}_{\text{ss}}\text{ T}}{\text{B T}_1\text{ M}}$
Diameter, *".505.*
Sectional area, **.20 square inch.**

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	*Per square inch.*					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	.....	
2,000	10,000	.000300	.000200	0.	.....	
3,000	15,000	.000450	.000150	0.	.....	
4,000	20,000	.000650	.000200	0.	.....	
5,000	25,000	.000850	.000200	0.	.....	
6,000	30,000	.001000	.000150	0.	.....	
7,000	35,000	.001150	.000150	0.	.....	
8,000	40,000	.001350	.000200	0.	.....	
9,000	45,000	.001500	.000150	.....	.....	Elastic limit.
9,200	46,000	.001750	.000250	.....	.....	
9,400	47,000	.003350	.001600	.....	.....	
9,600	48,000	.005350	.002000	.....	.....	
9,800	49,000	.006400	.001050	.....	.....	
10,000	50,000	.007400	.001000	.....	.....	
10,200	51,000	.008350	.000950	.....	.....	
10,400	52,000	.009350	.001000	.....	.....	
10,800	54,000	.011800	.002450	.....	.....	
11,200	56,000	.014400	.002600	.....	.....	
11,600	58,000	.015900	.001500	.....	.....	
12,000	60,000	.018550	.002650	.....	.....	
12,400	62,000	.021900	.003350	.....	.....	
12,800	64,000	.024350	.002450	.....	.....	
13,200	66,000	.027500	.003150	.....	.....	
13,600	68,000	.030600	.003100	.....	.....	
14,000	70,000	.033900	.003300	.....	.....	
14,400	72,000	.038000	.004100	.....	.....	
14,800	74,000	.043400	.005400	.....	.....	
15,200	76,000	.049500	.006100	.....	.....	
15,600	78,000	.056500	.007000	.....	.....	
16,000	80,000	.065500	.009000	.....	.....	
16,400	82,000	.0850	.0195	.....	.....	
16,800	84,000	.1100	.0250	.....	.....	
16,820	84,100	.1300	.0200	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	84,100
Elastic limit per square inch of original section	do....	45,000
Elongation per inch after rupture	inch..	0.1500
Elongation per inch under strain at elastic limit	do....	.001500
Reduction in diameter at point of rupture	do....	.045
Reduction in area after rupture, per centum of original section		16.9
Position of rupture		at middle of stem
Character of broken surface, flaky, 60 per cent.; granular, 40 per cent. Opened cracks in surface of stem.		
Elongation of inch sections		".18*, ".12*

No. 3552.

Marks, $\frac{22}{B}\frac{B_{20}}{T_2}\frac{T}{M}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	.....	
2,000	10,000	.000300	.000200	0.	.....	
3,000	15,000	.000500	.000200	0.	.....	
4,000	20,000	.000700	.000200	0.	.....	
5,000	25,000	.000800	.000100	0.	.....	
6,000	30,000	.001000	.000200	0.	.....	
7,000	35,000	.001200	.000200	0.	.....	
8,000	40,000	.001350	.000150	0.	.....	
8,200	41,000	.001400	.000050	.....	.....	
8,400	42,000	.001450	.000050	.....	.....	
8,600	43,000	.001450	0.	.....	.....	
8,800	44,000	.001500	.000050	.....	.....	
9,000	45,000	.001550	.000050	.....	.....	
9,200	46,000	.001600	.000050	.....	.....	Elastic limit.
9,400	47,000	.002600	.002000	.....	.....	
9,600	48,000	.004900	.001300	.....	.....	
9,800	49,000	.006000	.001100	.....	.....	
10,000	50,000	.007100	.001100	.....	.....	
10,200	51,000	.008000	.000900	.....	.....	
10,400	52,000	.009000	.001000	.....	.....	
10,600	53,000	.010000	.001000	.....	.....	
10,800	54,000	.011050	.001050	.....	.....	
11,200	56,000	.013350	.002300	.....	.....	
11,600	58,000	.016000	.002650	.....	.....	
12,000	60,000	.018500	.002500	.....	.....	
12,400	62,000	.021050	.002550	.....	.....	
12,800	64,000	.023700	.002650	.....	.....	
13,200	66,000	.026500	.002800	.....	.....	
13,600	68,000	.029600	.003100	.....	.....	
14,000	70,000	.033150	.003550	.....	.....	
14,400	72,000	.037500	.004350	.....	.....	
14,800	74,000	.042100	.004600	.....	.....	
15,200	76,000	.047850	.005250	.....	.....	
15,600	78,000	.054500	.007150	.....	.....	
16,000	80,000	.063500	.009000	.....	.....	
16,400	82,000	.077250	.013750	.....	.....	
16,800	84,000	.1050	.027750	.....	.....	
16,880	84,400	.1250	.0200	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds	84,400
Elastic limit per square inch of original section	do	46,000
Elongation per inch after rupture	inch	0.1250
Elongation per inch under strain at elastic limit	do	.001600
Reduction in diameter at point of rupture	do	.025
Reduction in area after rupture, per centum of original section		9.5
Position of rupture		″.85 from neck

Character of broken surface, granular; flaky spot at the circumference. Opened cracks in the surface of stem.

Elongation of inch sections ″.12, ″.18*

No. 3553.

Marks, $\frac{32\ R_{30}\ T}{M\ T_1\ M}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000150	.000150	0.	.....	
2,000	10,000	.000350	.000200	0.	.....	
3,000	15,000	.000500	.000150	0.	.....	
4,000	20,000	.000650	.000150	0.	.....	
5,000	25,000	.000800	.000150	0.	.....	
6,000	30,000	.001000	.000200	0.	.....	
7,000	35,000	.001150	.000150	0.	.....	
8,000	40,000	.001350	.000200	.000050	.000050	
9,000	45,000	.001500	.000150	.....	.....	
9,200	46,000	.001550	.000050	.....	.....	Elastic limit.
9,400	47,000	.002250	.000700	.....	.....	
9,600	48,000	.003900	.001650	.....	.....	
9,800	49,000	.005350	.001450	.....	.....	
10,000	50,000	.006250	.000900	.....	.....	
10,200	51,000	.007000	.000750	.....	.....	
10,400	52,000	.007700	.000700	.....	.....	
10,600	53,000	.008750	.001050	.....	.....	
10,800	54,000	.009700	.000950	.....	.....	
11,000	55,000	.010550	.000850	.....	.....	
11,200	56,000	.011800	.001250	.....	.....	
11,600	58,000	.013900	.002100	.....	.....	
12,000	60,000	.015750	.001850	.....	.....	
12,400	62,000	.018000	.002250	.....	.....	
12,800	64,000	.020600	.002600	.....	.....	
13,200	66,000	.023050	.002450	.....	.....	
13,600	68,000	.025850	.002800	.....	.....	
14,000	70,000	.029300	.003450	.....	.....	
14,400	72,000	.032750	.003450	.....	.....	
14,800	74,000	.036050	.003300	.....	.....	
15,200	76,000	.040500	.004450	.....	.....	
15,600	78,000	.046500	.006000	.....	.....	
16,000	80,000	.052500	.006000	.....	.....	
16,400	82,000	.0610	.0085	.....	.....	
16,800	84,000	.0725	.0115	.....	.....	
17,200	86,000	.0950	.0225	.....	.....	
17,340	86,700	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	86,700
Elastic limit per square inch of original section	do....	46,000
Elongation per inch after rupture	inch..	0.1200
Elongation per inch under strain at elastic limit	do....	.001550
Reduction in diameter at point of rupture	do....	.045
Reduction in area after rupture, per centum of original section		16.9
Position of rupture		1″ from neck
Character of broken surface, granular; flaky spot at circumference. Opened cracks in surface of stem.		
Elongation of inch sections		″.15*, ″.09

No. 3554.

Marks, $\frac{82\ Rs\ T}{M\ T_2\ M}$
Diameter, ".505
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.		
2,000	10,000	.000300	.000200	0.		
3,000	15,000	.000500	.000200	0.		
4,000	20,000	.000750	.000250	0.		
5,000	25,000	.000900	.000150	0.		
6,000	30,000	.001050	.000150	0.		
7,000	35,000	.001200	.000150	0.		
8,000	40,000	.001850	.000150	0.		
8,200	41,000	.001400	.000050			
8,400	42,000	.001450	.000050			
8,600	43,000	.001550	.000100			Elastic limit.
8,800	44,000	.001800	.000250			
9,000	45,000	.002750	.000950			
9,200	46,000	.003600	.000850			
9,400	47,000	.004300	.000700			
9,600	48,000	.005400	.001100			
9,800	49,000	.006600	.001200			
10,000	50,000	.008000	.001400			
10,200	51,000	.009250	.001250			
10,400	52,000	.010300	.001050			
10,600	53,000	.010950	.000650			
10,800	54,000	.011500	.000550			
11,200	56,000	.014250	.002750			
11,600	58,000	.016500	.002250			
12,000	60,000	.018750	.002250			
12,400	62,000	.022000	.003250			
12,800	64,000	.024250	.002250			
13,200	66,000	.027150	.002900			
13,600	68,000	.029750	.002600			
14,000	70,000	.033400	.003650			
14,400	72,000	.037850	.004450			
14,800	74,000	.042500	.004650			
15,200	76,000	.047850	.005350			
15,600	78,000	.056000	.008150			
16,000	80,000	.067000	.011000			
16,300	81,500					Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds	81,500
Elastic limit per square inch of original section	do	43,000
Elongation per inch after rupture	inch	0.0900
Elongation per inch under strain at elastic limit	do	.001550
Reduction in diameter at point of rupture	do	.035
Reduction in area after rupture, per centum of original section		13.2
Position of rupture		1" from neck
Character of broken surface, granular, 60 per cent.; flaky, 40 per cent. Opened crack in stem near the place of rupture.		
Elongation of inch sections		".06, ".12*

No. 3651.

Marks, $\frac{82\ Res\ T}{B\ T_1\ M}$
Diameter, $\frac{7}{8}$".505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000150	.000150	0.	.....	
2,000	10,000	.000300	.000150	0.	.....	
3,000	15,000	.000400	.000100	0.	.....	
4,000	20,000	.000600	.000200	0.	.....	
5,000	25,000	.000750	.000150	0.	.....	
6,000	30,000	.000900	.000150	0.	.....	
7,000	35,000	.001100	.000200	0.	.....	
8,000	40,000	.001250	.000150	0.	.....	
9,000	45,000	.001400	.000150	.....	.....	
9,200	46,000	.001450	.000050	.....	.....	
9,400	47,000	.001500	.000050	.....	.....	
9,600	48,000	.001600	.000100	.....	.....	Elastic limit.
9,800	49,000	.006050	.004450	.....	.....	
10,000	50,000	.007600	.001550	.....	.....	
10,200	51,000	.008800	.001200	.....	.....	
10,400	52,000	.009600	.000800	.....	.....	
10,600	53,000	.010400	.000800	.....	.....	
10,800	54,000	.011250	.000850	.....	.....	
11,200	56,000	.013250	.002000	.....	.....	
11,600	58,000	.015600	.002350	.....	.....	
12,000	60,000	.018100	.002500	.....	.....	
12,400	62,000	.020650	.002550	.....	.....	
12,800	64,000	.023050	.002400	.....	.....	
13,200	66,000	.025500	.002450	.....	.....	
13,600	68,000	.028750	.003250	.....	.....	
14,000	70,000	.032100	.003350	.....	.....	
14,400	72,000	.036100	.004000	.....	.....	
14,800	74,000	.040000	.003900	.....	.....	
15,200	76,000	.044850	.004850	.....	.....	
15,600	78,000	.052000	.007150	.....	.....	
16,000	80,000	.0575	.0055	.....	.....	
16,400	82,000	.0625	.0050	.....	.....	
16,800	84,000	.0850	.0225	.....	.....	
17,200	86,000	.1150	.0300	.....	.....	
17,280	86,300	.1450	.0300	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	86,300
Elastic limit per square inch of original section	do...	48,000
Elongation per inch after rupture	inch..	0.2500
Elongation per inch under strain at elastic limit	do....	.001600
Reduction in diameter at point of rupture	do....	.105
Reduction in area after rupture, per centum of original section		37.1
Position of rupture		".70 from neck
Character of broken surface		silky serrated
Elongation of inch sections		".18, ".32*

No. 3652.

Marks, $\frac{22\ Re\ T}{B\ T_4\ M}$
Diameter, ".505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000150	.000150	0.	.....	
2,000	10,000	.000250	.000100	0.	.....	
3,000	15,000	.000400	.000150	0.	.....	
4,000	20,000	.000550	.000150	0.	.....	
5,000	25,000	.000700	.000150	0.	.....	
6,000	30,000	.000850	.000150	0.	.....	
7,000	35,000	.001000	.000150	0.	.....	
8,000	40,000	.001200	.000200	0.	.....	
9,000	45,000	.001350	.000150	.....	.....	
9,200	46,000	.001400	.000050	.....	.....	
9,400	47,000	.001450	.000050	.....	.....	Elastic limit.
9,600	48,000	.002000	.000550	.....	.....	
9,800	49,000	.005750	.003750	.....	.....	
10,000	50,000	.007750	.002000	.....	.....	
10,200	51,000	.008300	.000550	.....	.....	
10,400	52,000	.008750	.000450	.....	.....	
10,600	53,000	.009750	.001000	.....	.....	
10,800	54,000	.011250	.001500	.....	.....	
11,200	56,000	.013600	.002350	.....	.....	
11,600	58,000	.016050	.002450	.....	.....	
12,000	60,000	.018400	.002350	.....	.....	
12,400	62,000	.020850	.002450	.....	.....	
12,800	64,000	.023750	.002900	.....	.....	
13,200	66,000	.026750	.003000	.....	.....	
13,600	68,000	.029800	.003050	.....	.....	
14,000	70,000	.033450	.003650	.....	.....	
14,400	72,000	.037500	.004050	.....	.....	
14,800	74,000	.042250	.004750	.....	.....	
15,200	76,000	.047100	.004850	.....	.....	
15,600	78,000	.054500	.007400	.....	.....	
16,000	80,000	.0600	.0055	.....	.....	
16,400	82,000	.0800	.0200	.....	.....	
16,800	84,000	.0950	.0150	.....	.....	
17,090	85,450	.1450	.0500	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	85,450
Elastic limit per square inch of original section	do....	47,000
Elongation per inch after rupture	inch..	0.2700
Elongation per inch under strain at elastic limit	do....	.001450
Reduction in diameter at point of rupture	do....	.145
Reduction in area after rupture, per centum of original section		49.1
Position of rupture		".85 from neck
Character of broken surface		silky
Elongation of inch sections		".17, ".37"

No. 3653.

Marks, $\frac{22\ R_{20}\ T}{M\ T_2\ M}$
Diameter, ".505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000150	.000150	0.		
2,000	10,000	.000300	.000150	0.		
3,000	15,000	.000500	.000200	0.		
4,000	20,000	.000700	.000200	0.		
5,000	25,000	.000900	.000200	0.		
6,000	30,000	.001000	.000100	0.		
7,000	35,000	.001200	.000200	0.		
8,000	40,000	.001400	.000200	.000050	.000050	
9,000	45,000	.001600	.000200			
9,200	46,000	.001650	.000050			
9,400	47,000	.001750	.000100			Elastic limit.
9,600	48,000	.002150	.000400			
9,800	49,000	.003400	.001250			
10,000	50,000	.004800	.001400			
10,200	51,000	.006000	.001200			
10,400	52,000	.007000	.001000			
10,600	53,000	.008200	.001200			
10,800	54,000	.009300	.001100			
11,200	56,000	.011300	.002000			
11,600	58,000	.013400	.002100			
12,000	60,000	.015350	.001950			
12,400	62,000	.017900	.002550			
12,800	64,000	.020050	.002150			
13,200	66,000	.022700	.002650			
13,600	68,000	.025550	.002850			
14,000	70,000	.029000	.003450			
14,400	72,000	.032550	.003550			
14,800	74,000	.035600	.003050			
15,200	76,000	.040000	.004400			
15,600	78,000	.045500	.005500			
16,000	80,000	.052000	.006500			
16,400	82,000	.059900	.007900			
16,800	84,000	.0700	.0101			
17,200	86,000	.0950	.0250			
17,380	86,900	.1300	.0350			Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	86,900
Elastic limit per square inch of original section	do....	47,000
Elongation per inch after rupture	inch..	0.2250
Elongation per inch under strain at elastic limit	do....	.001750
Reduction in diameter at point of rupture	do....	.145
Reduction in area after rupture, per centum of original section		49.1
Position of rupture		".50 from neck
Character of broken surface		silky
Elongation of inch sections		".33, ".12

No. 3654.

Marks, $\frac{32\ R_{30}\ T}{M\ T_4\ M}$
Diameter, $\frac{11}{16}$.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000150	.000150	0.	.....	
2,000	10,000	.000350	.000200	0.	.....	
3,000	15,000	.000500	.000150	0.	.....	
4,000	20,000	.000700	.000200	0.	.....	
5,000	25,000	.000850	.000150	0.	.....	
6,000	30,000	.001000	.000150	0.	.....	
7,000	35,000	.001250	.000250	0.	.....	
8,000	40,000	.001400	.000150	0.	.....	
9,000	45,000	.001550	.000150	.....	.....	
9,200	46,000	.001550	0.	.....	.....	
9,400	47,000	.001650	.000100	.....	.....	
9,600	48,000	.001750	.000100	.....	.....	
9,800	49,000	.001800	.000050	.....	.....	Elastic limit.
10,000	50,000	.002400	.000600	.....	.....	
10,200	51,000	.004250	.001850	.....	.....	
10,400	52,000	.005500	.001250	.....	.....	
10,600	53,000	.007000	.001500	.....	.....	
10,800	54,000	.008100	.001100	.....	.....	
11,200	56,000	.010500	.002400	.....	.....	
11,600	58,000	.012600	.002100	.....	.....	
12,000	60,000	.015000	.002400	.....	.....	
12,400	62,000	.017500	.002500	.....	.....	
12,800	64,000	.020000	.002500	.....	.....	
13,200	66,000	.022700	.002700	.....	.....	
13,600	68,000	.025600	.002900	.....	.....	
14,000	70,000	.028900	.003300	.....	.....	
14,400	72,000	.032250	.003350	.....	.....	
14,800	74,000	.036400	.004150	.....	.....	
15,200	76,000	.042250	.005850	.....	.....	
15,600	78,000	.046500	.004250	.....	.....	
16,000	80,000	.054250	.007750	.....	.....	
16,400	82,000	.062750	.008500	.....	.....	
16,800	84,000	.0750	.012250	.....	.....	
17,170	85,850	.1150	.0400	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	85,850
Elastic limit per square inch of original section	do....	49,000
Elongation per inch after rupture	inch..	0.2050
Elongation per inch under strain at elastic limit	do....	.001800
Reduction in diameter at point of rupture	do....	.145
Reduction in area after rupture, per centum of original section		49.1
Position of rupture		1".20 from neck
Character of broken surface		silky
Elongation of inch sections		".17*, ".24*

No. 3617.

Marks, $\frac{32\,R_{11}\,T}{B\,T_1\,M}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads. Total.	Applied loads. Per square inch.	Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000200	.000200	0.	.....	
2,000	10,000	.000350	.000150	0.	.....	
3,000	15,000	.000550	.000200	0.	.....	
4,000	20,000	.000700	.000150	0.	.....	
5,000	25,000	.000850	.000150	0.	.....	
6,000	30,000	.001000	.000150	0.	.....	
7,000	35,000	.001200	.000200	.....	.....	
8,000	40,000	.001350	.000150	.....	.....	
9,000	45,000	.001550	.000200	.....	.....	
9,200	46,000	.001600	.000050	.....	.....	
9,400	47,000	.001650	.000050	.....	.....	
9,600	48,000	.001700	.000050	.....	.....	
9,800	49,000	.001850	.000150	.....	.....	Elastic limit.
10,000	50,000	.002100	.000250	.....	.....	
10,200	51,000	.003000	.000900	.....	.....	
10,400	52,000	.003850	.000850	.....	.....	
10,600	53,000	.007250	.003400	.....	.....	
10,800	54,000	.008850	.001600	.....	.....	
11,200	56,000	.010650	.001800	.....	.....	
11,600	58,000	.013050	.002400	.....	.....	
12,000	60,000	.015600	.002550	.....	.....	
12,400	62,000	.018050	.002450	.....	.....	
12,800	64,000	.020850	.002800	.....	.....	
13,200	66,000	.023500	.002650	.....	.....	
13,600	68,000	.026350	.002850	.....	.....	
14,000	70,000	.030250	.003900	.....	.....	
14,400	72,000	.034000	.003750	.....	.....	
14,800	74,000	.037750	.003750	.....	.....	
15,200	76,000	.043550	.005800	.....	.....	
15,600	78,000	.049100	.005550	.....	.....	
16,000	80,000	.056750	.007650	.....	.....	
16,400	82,000	.067000	.010250	.....	.....	
16,800	84,000	.0800	.0130	.....	.....	
17,200	86,000	.1200	.0400	.....	.....	
17,210	86,050	.1450	0250	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	86,050
Elastic limit per square inch of original section	do ...	49,000
Elongation per inch after rupture	inch..	0.1800
Elongation per inch under strain at elastic limit	do....	.001850
Reduction in diameter at point of rupture	do....	.075
Reduction in area after rupture, per centum of original section		27.4
Position of rupture		″.65 from neck
Character of broken surface		granular; flaky spot at circumference
Elongation of inch sections		″.22*, ″.14

No. 3618.

Marks, $\frac{32\ R_{21}\ T}{B\ T_2\ M}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000150	.000150	0.	.....	
2,000	10,000	.000350	.000200	0.	.....	
3,000	15,000	.000550	.000200	0.	.....	
4,000	20,000	.000700	.000150	0.	.....	
5,000	25,000	.000850	.000150	0.	.....	
6,000	30,000	.001050	.000200	0.	.....	
7,000	35,000	.001200	.000150	.....	.....	
8,000	40,000	.001400	.000200	.....	.....	
9,000	45,000	.001550	.000150	.....	.....	
9,200	46,000	.001600	.000050	.....	.....	
9,400	47,000	.001650	.000050	.....	.....	
9,600	48,000	.001700	.000050	.....	.....	
9,800	49,000	.001750	.000050	.....	.....	
10,000	50,000	.001800	.000050	.....	.....	Elastic limit.
10,200	51,000	.001950	.000150	.....	.....	
10,400	52,000	.003900	.001950	.....	.....	
10,600	53,000	.005600	.001700	.....	.....	
10,800	54,000	.007300	.001700	.....	.....	
11,200	56,000	.009600	.002300	.....	.....	
11,600	58,000	.012000	.002400	.....	.....	
12,000	60,000	.014250	.002250	.....	.....	
12,400	62,000	.016550	.002300	.....	.....	
12,800	64,000	.019050	.002500	.....	.....	
13,200	66,000	.021900	.002850	.....	.....	
13,600	68,000	.024700	.002800	.....	.....	
14,000	70,000	.027500	.002800	.....	.....	
14,400	72,000	.031250	.003750	.....	.....	
14,800	74,000	.034900	.003650	.....	.....	
15,200	76,000	.039000	.004100	.....	.....	
15,600	78,000	.044400	.005400	.....	.....	
16,000	80,000	.050750	.006350	.....	.....	
16,400	82,000	.058750	.008000	.....	.....	
16,800	84,000	.0710	.012250	.....	.....	
17,200	86,000	.0900	.0190	.....	.....	
17,480	87,400	.1300	.0400	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds	87,400
Elastic limit per square inch of original section	do	50,000
Elongation per inch after rupture	inch	0.1500
Elongation per inch under strain at elastic limit	do	.001800
Reduction in diameter at point of rupture	do	.065
Reduction in area after rupture, per centum of original section		23.9
Position of rupture		″.65 from neck
Character of broken surface, granular, flaky spot at circumference. Opened cracks in surface of stem.		
Elongation of inch sections		″.18*, ″.12

No. 3619.

Marks, $\frac{32\ R_{21}\ T}{M\ T_1\ M}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
[illegible]	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000200	.000200	0.		
2,000	10,000	.000350	.000150	0.		
3,000	15,000	.000500	.000150	0.		
4,000	20,000	.000650	.000150	0.		
5,000	25,000	.000850	.000200	0.		
6,000	30,000	.001000	.000150	0.		
7,000	35,000	.001200	.000200			
8,000	40,000	.001350	.000150			
9,000	45,000	.001500	.000150			
9,200	46,000	.001550	.000050			
9,400	47,000	.001600	.000050			
9,600	48,000	.001650	.000050			Elastic limit.
9,800	49,000	.001750	.002100			
10,000	50,000	.005500	.001750			
10,200	51,000	.007750	.002250			
10,400	52,000	.009000	.001250			
10,600	53,000	.010150	.001150			
10,800	54,000	.011400	.001250			
11,000	55,000	.013050	.001650			
11,200	56,000	.014850	.001800			
12,000	60,000	.017400	.002450			
12,400	62,000	.019800	.002600			
12,800	64,000	.022700	.002800			
13,200	66,000	.025600	.002900			
13,600	68,000	.028500	.002900			
14,000	70,000	.031750	.003250			
14,400	72,000	.035850	.004100			
14,800	74,000	.040550	.004700			
15,200	76,000	.046050	.005500			
15,600	78,000	.051750	.005700			
16,000	80,000	.060500	.008750			
16,400	82,000	.072500	.012000			
16,800	84,000	.089750	.017250			
17,160	85,800	.1400	.050250			Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	85,800
Elastic limit per square inch of original section	do ...	48,000
Elongation per inch after rupture	inch..	0.2350
Elongation per inch under strain at elastic limit	do....	.001650
Reduction in diameter at point of rupture	do....	.105
Reduction in area after rupture, per centum of original section		37.1
Position of rupture		″.50 from neck
Character of broken surface	silky, serrated. Small granular spot at circumference	
Elongation of inch sections		″.28*, ″.19

No. 3620.

Marks, $\frac{32\ R_{in}\ T}{M\ T_2\ M}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000150	.000150	0.	.....	
2,000	10,000	.000350	.000200	0.	.....	
3,000	15,000	.000500	.000150	0.	.....	
4,000	20,000	.000650	.000150	0.	.....	
5,000	25,000	.000800	.000150	0.	.....	
6,000	30,000	.001000	.000200	0.	.....	
7,000	35,000	.001150	.000150	0.	.....	
8,000	40,000	.001350	.000200	0.	.....	
9,000	45,000	.001500	.000150	.....	.....	
9,200	46,000	.001550	.000050	.....	.....	
9,400	47,000	.001600	.000050	.....	.....	
9,600	48,000	.001650	.000050	.....	.....	Elastic limit.
9,800	49,000	.004400	.002750	.....	.....	
10,000	50,000	.005750	.001350	.....	.....	
10,200	51,000	.007000	.001250	.....	.....	
10,400	52,000	.008000	.001000	.....	.....	
10,600	53,000	.009050	.001050	.....	.....	
10,800	54,000	.009750	.000700	.....	.....	
11,200	56,000	.011750	.002000	.....	.....	
11,600	58,000	.013750	.002000	.....	.....	
12,000	60,000	.016200	.002450	.....	.....	
12,400	62,000	.019250	.003050	.....	.....	
12,800	64,000	.021500	.002250	.....	.....	
13,200	66,000	.024000	.002500	.....	.....	
13,600	68,000	.026250	.002250	.....	.....	
14,000	70,000	.029500	.003250	.....	.....	
14,400	72,000	.033500	.004000	.....	.....	
14,800	74,000	.037100	.003600	.....	.....	
15,200	76,000	.040850	.003750	.....	.....	
15,600	78,000	.047000	.006150	.....	.....	
16,000	80,000	.053750	.006750	.....	.....	
16,400	82,000	.063400	.009650	.....	.....	
16,800	84,000	.0750	.0116	.....	.....	
17,200	86,000	.1000	.0250	.....	.....	
17,410	87,050	.1500	.0500	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	87,050
Elastic limit per square inch of original section	do....	48,000
Elongation per inch after rupture	inch..	0.2100
Elongation per inch under strain at elastic limit	do....	.001650
Reduction in diameter at point of rupture	do....	.125
Reduction in area after rupture, per centum of original section		43.3
Position of rupture		″.90 from neck
Character of broken surface		silky
Elongation of inch sections		″.30, ″.12

No. 3661.

Marks, $\frac{32\ Eq\ T}{B\ T_2\ M}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	.....	
2,000	10,000	.000300	.000200	0.	.....	
3,000	15,000	.000450	.000150	0.	.....	
4,000	20,000	.000600	.000150	0.	.....	
5,000	25,000	.000800	.000200	0.	.....	
6,000	30,000	.000950	.000150	0.	.....	
7,000	35,000	.001100	.000150	0.	.....	
8,000	40,000	.001300	.000200	0.	.....	
9,000	45,000	.001450	.000150	.....	.....	
9,200	46,000	.001500	.000050	.....	.....	
9,400	47,000	.001550	.000050	.....	.....	
9,600	48,000	.001600	.000050	.....	.....	
9,800	49,000	.001600	0.	.....	.....	
10,000	50,000	.001700	.000100	.....	.....	Elastic limit.
10,200	51,000	.008200	.006500	.....	.....	
10,400	52,000	.009000	.000800	.....	.....	
10,600	53,000	.010000	.001000	.....	.....	
10,800	54,000	.011400	.001400	.....	.....	
11,000	55,000	.012400	.001000	.....	.....	
11,200	56,000	.013200	.000800	.....	.....	
11,600	58,000	.015350	.002150	.....	.....	
12,000	60,000	.018500	.003150	.....	.....	
12,400	62,000	.020850	.002350	.....	.....	
12,800	64,000	.023750	.002900	.....	.....	
13,200	66,000	.026500	.002750	.....	.....	
13,600	68,000	.030000	.003500	.....	.....	
14,000	70,000	.034000	.004000	.....	.....	
14,400	72,000	.038750	.004750	.....	.....	
14,800	74,000	.043500	.004750	.....	.....	
15,200	76,000	.049500	.006000	.....	.....	
15,600	78,000	.057250	.007750	.....	.....	
16,000	80,000	.067000	.009750	.....	.....	
16,400	82,000	.082400	.015400	.....	.....	
16,800	84,000	.1150	.0326	.....	.....	
16,920	84,600	.1400	.0250	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	84,600
Elastic limit per square inch of original section	do....	50,000
Elongation per inch after rupture	inch..	0.2450
Elongation per inch under strain at elastic limit	do....	.001700
Reduction in diameter at point of rupture	do....	.105
Reduction in area after rupture, per centum of original section		37.1
Position of rupture		1″.10 from neck
Character of broken surface		silky serrated. Opened cracks in surface of stem
Elongation of inch sections		″.32*, ″.17

No. 3662.

Marks, $\frac{32\ R_{81}\ T}{B\ T_4\ M}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.		
2,000	10,000	.000300	.000200	0.		
3,000	15,000	.000450	.000150	0.		
4,000	20,000	.000600	.000150	0.		
5,000	25,000	.000800	.000200	0.		
6,000	30,000	.000950	.000150	0.		
7,000	35,000	.001100	.000150	0.		
8,000	40,000	.001300	.000200	0.		
9,000	45,000	.001500	.000200			
9,200	46,000	.001500	0.			
9,400	47,000	.001550	.000050			
9,600	48,000	.001600	.000050			
9,800	49,000	.001650	.000050			Elastic limit.
10,000	50,000	.007400	.005750			
10,200	51,000	.008500	.001100			
10,400	52,000	.009600	.001100			
10,600	53,000	.010850	.001250			
10,800	54,000	.012000	.001150			
11,200	56,000	.014750	.002750			
11,600	58,000	.016600	.001850			
12,000	60,000	.019500	.002900			
12,400	62,000	.022500	.003000			
12,800	64,000	.025350	.002850			
13,200	66,000	.028750	.003400			
13,600	68,000	.032500	.003750			
14,000	70,000	.036750	.004250			
14,400	72,000	.042250	.005500			
14,800	74,000	.048500	.006250			
15,200	76,000	.055000	.006500			
15,600	78,000	.065000	.010000			
16,000	80,000	.081000	.0160			
16,400	82,000	.1100	.0290			
16,510	82,550	.1450	.0350			Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds	82,550
Elastic limit per square inch of original section	do	49,000
Elongation per inch after rupture	inch	0.2450
Elongation per inch under strain at elastic limit	do	.001650
Reduction in diameter at point of rupture	do	.125
Reduction in area after rupture, per centum of original section		43.3
Position of rupture		1″.10 from neck
Character of broken surface		silky
Elongation of inch sections		″.32, ″.17

No. 3663.

Marks, $\frac{22\ E_M\ T}{M\ T_2\ M}$
Diameter, ".505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000150	.000150	0.		
2,000	10,000	.000350	.000200	0.		
3,000	15,000	.000500	.000150	0.		
4,000	20,000	.000700	.000200	0.		
5,000	25,000	.000850	.000150	0.		
6,000	30,000	.001000	.000150	0.		
7,000	35,000	.001200	.000200	0.		
8,000	40,000	.001350	.000150	0.		
8,600	45,000	.001500	.000150			
9,200	46,000	.001550	.000050			
9,400	47,000	.001600	.000050			
9,600	48,000	.001700	.000100			
9,800	49,000	.001700	0.			
10,000	50,000	.001750	.000050			Elastic limit.
10,200	51,000	.004250	.002500			
10,400	52,000	.005900	.001650			
10,600	53,000	.007050	.001150			
10,800	54,000	.008100	.001050			
11,000	55,000	.009100	.001000			
11,200	56,000	.010400	.001300			
11,600	58,000	.012550	.002150			
12,000	60,000	.015500	.002950			
12,400	62,000	.017600	.002100			
12,800	64,000	.019850	.002250			
13,200	66,000	.023000	.003150			
13,600	68,000	.025600	.002600			
14,000	70,000	.029000	.003400			
14,400	72,000	.032900	.003900			
14,800	74,000	.037000	.004100			
15,200	76,000	.041750	.004750			
15,600	78,000	.047900	.006150			
16,000	80,000	.055000	.007100			
16,400	82,000	.065500	.010500			
16,800	84,000	.082500	.0170			
17,180	85,900	.1250	.0425			Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	85,900
Elastic limit per square inch of original section	do....	50,000
Elongation per inch after rupture	inch..	a. 2100
Elongation per inch under strain at elastic limit	do....	.001750
Reduction in diameter at point of rupture	do....	.135
Reduction in area after rupture, per centum of original section		46.2
Position of rupture		1".10 from neck
Character of broken surface		silky, serrated
Elongation of inch sections		".28," ".14

No. 3664.

Marks, $\frac{32\ R_{31}\ T}{M\ T_4\ M}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	.....	
2,000	10,000	.000250	.000150	0.	.....	
3,000	15,000	.000500	.000250	0.	.....	
4,000	20,000	.000650	.000150	0.	.....	
5,000	25,000	.000800	.000150	0.	.....	
6,000	30,000	.000950	.000150	0.	.....	
7,000	35,000	.001100	.000150	0.	.....	
8,000	40,000	.001250	.000150	0.	.....	
9,000	45,000	.001450	.000200	.....	.....	
9,200	46,000	.001500	.000050	.....	.....	
9,400	47,000	.001550	.000050	.....	.....	
9,600	48,000	.001550	0.	.....	.....	Elastic limit.
9,800	49,000	.001750	.000200	.....	.....	
10,000	50,000	.002650	.000900	.....	.....	
10,200	51,000	.003550	.000900	.....	.....	
10,400	52,000	.004750	.001200	.....	.....	
10,600	53,000	.006000	.001250	.....	.....	
10,800	54,000	.007500	.001500	.....	.....	
11,200	56,000	.010000	.002500	.....	.....	
11,600	58,000	.012400	.002400	.....	.....	
12,000	60,000	.015000	.002600	.....	.....	
12,400	62,000	.017750	.002750	.....	.....	
12,800	64,000	.019850	.002100	.....	.....	
13,200	66,000	.022500	.002650	.....	.....	
13,600	68,000	.025750	.003250	.....	.....	
14,000	70,000	.029750	.004000	.....	.....	
14,400	72,000	.033500	.003750	.....	.....	
14,800	74,000	.037250	.003750	.....	.....	
15,200	76,000	.042100	.004850	.....	.....	
15,600	78,000	.048750	.006650	.....	.....	
16,000	80,000	.057000	.008250	.....	.....	
16,400	82,000	.068250	.011250	.....	.....	
16,800	84,000	.0850	.016750	.....	.....	
16,980	84,900	.1200	.0350	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	84,900
Elastic limit per square inch of original section	do....	48,000
Elongation per inch after rupture	inch..	0.2100
Elongation per inch under strain at elastic limit	do....	.001500
Reduction in diameter at point of rupture	do....	.145
Reduction in area after rupture, per centum of original section		49.1
Position of rupture		″.95 from neck
Character of broken surface		silky
Elongation of inch sections		″.32*, ″.10

No. 3547.

Marks, $\frac{32\ R_{24}\ T}{B\ T_1\ M}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads. Total.	Applied loads. Per square inch.	Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000150	.000150	0.	.....	
2,000	10,000	.000350	.000200	0.	.....	
3,000	15,000	.000500	.000150	0.	.....	
4,000	20,000	.000650	.000150	0.	.....	
5,000	25,000	.000850	.000200	0.	.....	
6,000	30,000	.001050	.000200	0.	.....	
7,000	35,000	.001200	.000150	0.	.....	
8,000	40,000	.001350	.000150	.000050	.000050	
9,000	45,000	.001550	.000200	.....	.....	Elastic limit.
9,200	46,000	.003200	.001650	.....	.....	
9,400	47,000	.004500	.001300	.....	.....	
9,600	48,000	.006200	.001700	.....	.....	
9,800	49,000	.006900	.000700	.....	.....	
10,000	50,000	.007850	.000950	.....	.....	
10,200	51,000	.008750	.000900	.....	.....	
10,400	52,000	.009800	.001050	.....	.....	
10,600	53,000	.010800	.001000	.....	.....	
10,800	54,000	.011650	.000850	.....	.....	
11,000	55,000	.012600	.000950	.....	.....	
11,200	56,000	.013800	.001200	.....	.....	
11,400	57,000	.014600	.000800	.....	.....	
11,600	58,000	.015750	.001150	.....	.....	
11,800	59,000	.017000	.001250	.....	.....	
12,000	60,000	.018500	.001500	.....	.....	
12,400	62,000	.020600	.002100	.....	.....	
12,800	64,000	.023300	.002700	.....	.....	
13,200	66,000	.026150	.002850	.....	.....	
13,600	68,000	.029500	.003350	.....	.....	
14,000	70,000	.032800	.003300	.....	.....	
14,400	72,000	.037150	.004350	.....	.....	
14,800	74,000	.042000	.004850	.....	.....	
15,200	76,000	.047000	.005000	.....	.....	
15,600	78,000	.053500	.006500	.....	.....	
16,000	80,000	.062350	.008850	.....	.....	
16,400	82,000	.0750	.013650	.....	.....	
16,800	84,000	.1000	.0250	.....	.....	
17,080	85,400	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	85,400
Elastic limit per square inch of original section	do....	45,000
Elongation per inch after rupture	inch..	0.1700
Elongation per inch under strain at elastic limit	do ...	.001550
Reduction in diameter at point of rupture	do....	.085
Reduction in area after rupture, per centum of original section		30.7
Position of rupture		″.75 from neck
Character of broken surface ....silky serrated. Opened cracks in stem in vicinity of place of rupture		
Elongation of inch sections		″.12, ″.22*

No. 3548.

Marks, $\frac{32\ R_{34}\ T}{B\ T_2\ M}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	.....	.....	
2,000	10,000	.000300	.000200	.....	.....	
3,000	15,000	.000450	.000150	.....	.....	
4,000	20,000	.000600	.000150	.....	.....	
5,000	25,000	.000800	.000200	.....	.....	
6,000	30,000	.000950	.000150	.....	.....	
7,000	35,000	.001050	.000100	.....	.....	
8,000	40,000	.001200	.000150	.....	.....	
8,200	41,000	.001200	0.	.....	.....	
8,400	42,000	.001250	.000050	.....	.....	
8,600	43,000	.001350	.000100	.....	.....	
8,800	44,000	.001400	.000050	.....	.....	
9,000	45,000	.001450	.000050	.....	.....	Elastic limit.
9,200	46,000	.003000	.001550	.....	.....	
9,400	47,000	.004950	.001950	.....	.....	
9,600	48,000	.005850	.000900	.....	.....	
9,800	49,000	.006850	.001000	.....	.....	
10,000	50,000	.008000	.001150	.....	.....	
10,200	51,000	.009050	.001050	.....	.....	
10,400	52,000	.010050	.001000	.....	.....	
10,800	54,000	.012350	.002300	.....	.....	
11,200	56,000	.014700	.002350	.....	.....	
11,600	58,000	.017400	.002700	.....	.....	
12,000	60,000	.020350	.002950	.....	.....	
12,400	62,000	.023250	.002900	.....	.....	
12,800	64,000	.026050	.002800	.....	.....	
13,200	66,000	.029100	.003050	.....	.....	
13,600	68,000	.033100	.004000	.....	.....	
14,000	70,000	.037750	.004650	.....	.....	
14,400	72,000	.042900	.005150	.....	.....	
14,800	74,000	.049750	.006850	.....	.....	
15,200	76,000	.0570	.007250	.....	.....	
15,600	78,000	.0685	.0115	.....	.....	
15,940	79,700	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	79,700
Elastic limit per square inch of original section	do....	45,000
Elongation per inch after rupture	inch..	0.0950
Elongation per inch under strain at elastic limit	do....	.001450
Reduction in diameter at point of rupture	do....	.035
Reduction in area after rupture, per centum of original section		13.2
Position of rupture		″ 85 from neck

Character of broken surface, granular; flaky spot at the circumference. Opened cracks in the surface of stem.

Elongation of inch sections ..... ″.08, ″.11*

No. 3549.

Marks, $\frac{32\ R_{14}\ T}{M\ T;\ M}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads. Total.	Applied loads. Per square inch.	Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000150	.000150	0.	.....	
2,000	10,000	.000300	.000150	0.	.....	
3,000	15,000	.000450	.000150	0.	.....	
4,000	20,000	.000600	.000150	0.	.....	
5,000	25,000	.000750	.000150	0.	.....	
6,000	30,000	.000950	.000200	0.	.....	
7,000	35,000	.001100	.000150	0.	.....	
8,000	40,000	.001250	.000150	0.	.....	
8,800	44,000	.001350	.000100	.....	.....	
9,000	45,000	.001450	.000100	.....	.....	Elastic limit.
9,200	46,000	.004000	.002550	.....	.....	
9,400	47,000	.005000	.001000	.....	.....	
9,600	48,000	.005650	.000650	.....	.....	
9,800	49,000	.006600	.000950	.....	.....	
10,000	50,000	.007500	.000900	.....	.....	
10,200	51,000	.008400	.000900	.....	.....	
10,400	52,000	.009500	.001100	.....	.....	
10,600	53,000	.010500	.001000	.....	.....	
10,800	54,000	.011300	.000800	.....	.....	
11,000	55,000	.012250	.000950	.....	.....	
11,200	56,000	.013400	.001150	.....	.....	
11,400	57,000	.014500	.001100	.....	.....	
11,600	58,000	.015500	.001000	.....	.....	
11,800	59,000	.016550	.001050	.....	.....	
12,000	60,000	.017500	.000950	.....	.....	
12,400	62,000	.020250	.002750	.....	.....	
12,800	64,000	.022650	.002400	.....	.....	
13,200	66,000	.025350	.002700	.....	.....	
13,600	68,000	.028400	.003050	.....	.....	
14,000	70,000	.031850	.003450	.....	.....	
14,400	72,000	.035600	.003750	.....	.....	
14,800	74,000	.039900	.004300	.....	.....	
15,200	76,000	.045000	.005100	.....	.....	
15,600	78,000	.051750	.006750	.....	.....	
16,000	80,000	.0590	.007250	.....	.....	
16,020	80,100	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	80,100
Elastic limit per square inch of original section	do....	45,000
Elongation per inch after rupture	inch..	0.0850
Elongation per inch under strain at elastic limit	do....	.001450
Reduction in diameter at point of rupture	do ...	.075
Reduction in area after rupture, per centum of original section		27.4
Position of rupture		″.40 from neck
Character of broken surface		silky, flaky
Elongation of inch sections		″.12*, ″.05

No. 3550.

Marks, $\frac{32\ R_{34}\ T}{M\ T_2\ M}$
Diameter, ".505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000200	.000200	0.	.....	
2,000	10,000	.000350	.000150	0.	.....	
3,000	15,000	.000600	.000250	0.	.....	
4,000	20,000	.000750	.000150	0.	.....	
5,000	25,000	.000950	.000200	.000050	.000050	
6,000	30,000	.001100	.000150	.000050	0.	
7,000	35,000	.001300	.000200	.000100	.000050	
8,000	40,000	.001450	.000150	.000100	0.	
8,200	41,000	.001500	.000050	.....	.....	
8,400	42,000	.001600	.000100	.....	.....	Elastic limit.
8,600	43,000	.002750	.001150	.....	.....	
8,800	44,000	.003650	.000900	.....	.....	
9,000	45,000	.004900	.001250	.....	.....	
9,200	46,000	.005650	.000750	.....	.....	
9,400	47,000	.006400	.000750	.....	.....	
9,600	48,000	.007400	.001000	.....	.....	
9,800	49,000	.008400	.001000	.....	.....	
10,000	50,000	.009000	.000600	.....	.....	
10,200	51,000	.010000	.001000	.....	.....	
10,400	52,000	.010950	.000950	.....	.....	
10,600	53,000	.011900	.000950	.....	.....	
10,800	54,000	.012900	.001000	.....	.....	
11,000	55,000	.013900	.001000	.....	.....	
11,200	56,000	.014850	.000950	.....	.....	
11,600	58,000	.017050	.002200	.....	.....	
12,000	60,000	.019500	.002450	.....	.....	
12,400	62,000	.022250	.002750	.....	.....	
12,800	64,000	.024650	.002400	.....	.....	
13,200	66,000	.027550	.002900	.....	.....	
13,600	68,000	.030650	.003100	.....	.....	
14,000	70,000	.034500	.003850	.....	.....	
14,400	72,000	.038400	.003900	.....	.....	
14,800	74,000	.043250	.004850	.....	.....	
15,200	76,000	.048750	.005500	.....	.....	
15,600	78,000	.056250	.007500	.....	.....	
16,000	80,000	.0660	.009750	.....	.....	
16,400	82,000	.0800	.0140	.....	.....	
16,750	83,750	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds	83,750
Elastic limit per square inch of original section	do	42,000
Elongation per inch after rupture	inch	0.1000
Elongation per inch under strain at elastic limit	do	.001600
Reduction in diameter at point of rupture	do	.015
Reduction in area after rupture, per centum of original section		5.7
Position of rupture		".30 from neck
Character of broken surface		granular, radiating from a flaky spot at the circumference
Elongation of inch sections		".09, ".11*

No. 3655.

Marks, $\frac{32\ R_{34}\ T}{B\ T_3\ M}$
Diameter, ".505.
Sectional area, .20 square inch.

Applied loads. Total.	Applied loads. Per square inch.	Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	.....	
2,000	10,000	.000250	.000150	0.	.....	
3,000	15,000	.000350	.000100	0.	.....	
4,000	20,000	.000500	.000150	0.	.....	
5,000	25,000	.000700	.000200	0.	.....	
6,000	30,000	.000900	.000200	0.	.....	
7,000	35,000	.001050	.000150	0.	.....	
8,000	40,000	.001200	.000150	0.	.....	
9,000	45,000	.001400	.000200	.....	.....	
9,200	46,000	.001450	.000050	.....	.....	
9,400	47,000	.001500	.000050	.....	.....	
9,600	48,000	.001550	.000050	.....	.....	Elastic limit.
9,800	49,000	.003000	.001450	.....	.....	
10,000	50,000	.004000	.001000	.....	.....	
10,200	51,000	.007000	.003000	.....	.....	
10,400	52,000	.007650	.000650	.....	.....	
10,600	53,000	.008600	.000950	.....	.....	
10,800	54,000	.009600	.001000	.....	.....	
11,000	55,000	.010500	.000900	.....	.....	
11,200	56,000	.011550	.001050	.....	.....	
11,600	58,000	.013550	.002000	.....	.....	
12,000	60,000	.016250	.002700	.....	.....	
12,400	62,000	.018500	.002250	.....	.....	
12,800	64,000	.020850	.002350	.....	.....	
13,200	66,000	.023400	.002550	.....	.....	
13,600	68,000	.026350	.002950	.....	.....	
14,000	70,000	.029250	.002900	.....	.....	
14,400	72,000	.033250	.004000	.....	.....	
14,800	74,000	.036850	.003600	.....	.....	
15,200	76,000	.041400	.004550	.....	.....	
15,600	78,000	.047000	.005600	.....	.....	
16,000	80,000	.053250	.006250	.....	.....	
16,400	82,000	.0616	.008350	.....	.....	
16,800	84,000	.0750	.0134	.....	.....	
17,200	86,000	.0950	.0200	.....	.....	
17,310	86,550	.1300	.0450	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	86,550
Elastic limit per square inch of original section	do....	48,000
Elongation per inch after rupture	inch..	0.1900
Elongation per inch under strain at elastic limit	do....	.001550
Reduction in diameter at point of rupture	do....	.125
Reduction in area after rupture, per centum of original section		43.3
Position of rupture		".90 from neck
Character of broken surface		silky serrated
Elongation of inch sections		".11, ".27*

No. 3656.

Marks, $\frac{32\ R_{84}\ T}{B\ T_4\ M}$
Diameter, ".505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000150	.000150	0.	.....	
2,000	10,000	.000350	.000200	0.	.....	
3,000	15,000	.000550	.000200	0.	.....	
4,000	20,000	.000700	.000150	0.	.....	
5,000	25,000	.000850	.000150	0.	.....	
6,000	30,000	.001050	.000200	0.	.....	
7,000	35,000	.001250	.00 200	0.	.....	
8,000	40,000	.001400	.000150	0.	.....	
9,000	45,000	.001550	.000150	.....	.....	
9,200	46,000	.001600	.000050	.....	.....	
9,400	47,000	.001650	.000050	.....	.....	
9,600	48,000	.001700	.000050	.....	.....	
9,800	49,000	.001750	.000050	.....	.....	
10,000	50,000	.001850	.000100	.....	.....	Elastic limit.
10,200	51,000	.002850	.001000	.....	.....	
10,400	52,000	.005350	.002500	.....	.....	
10,600	53,000	.007850	.002500	.....	.....	
10,800	54,000	.009000	.001550	.....	.....	
11,200	56,000	.010650	.001650	.....	.....	
11,600	58,000	.012850	.002200	.....	.....	
12,000	60,000	.015000	.002150	.....	.....	
12,400	62,000	.017250	.002250	.....	.....	
12,800	64,000	.019250	.002000	.....	.....	
13,200	66,000	.021600	.002350	.....	.....	
13,600	68,000	.024250	.002650	.....	.....	
14,000	70,000	.027250	.003000	.....	.....	
14,400	72,000	.030500	.003250	.....	.....	
14,800	74,000	.034000	.003500	.....	.....	
15,200	76,000	.037850	.003850	.....	.....	
15,600	78,000	.043000	.005150	.....	.....	
16,000	80,000	.048500	.005500	.....	.....	
16,400	82,000	.055500	.007000	.....	.....	
16,800	84,000	.064350	.008850	.....	.....	
17,200	86,000	.0800	.015650	.....	.....	
17,600	88,000	.1000	.0200	.....	.....	
17,800	89,000	.1500	.0500	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	89,000
Elastic limit per square inch of original section	do....	50,000
Elongation per inch after rupture	inch..	0.2800
Elongation per inch under strain at elastic limit	do....	.001850
Reduction in diameter at point of rupture	do....	.125
Reduction in area after rupture, per centum of original section		43.3
Position of rupture		".50 from neck
Character of broken surface		silky serrated
Elongation of inch sections		".14, ".32"

No. 3657.

Marks, $\frac{32\ Ra\ T}{M\ T_2\ M}$
Diameter, ".505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	.0.	Initial load
1,000	5,000	.000150	.000150	0.	.....	
2,000	10,000	.000350	.000200	0.	.....	
3,000	15,000	.000500	.000150	0.	.....	
4,000	20,000	.000650	.000150	0.	.....	
5,000	25,000	.000850	.000200	0.	.....	
6,000	30,000	.000950	.000100	0.	.....	
7,000	35,000	.001150	.000200	0.	.....	
8,000	40,000	.001400	.000250	0.	.....	
9,000	45,000	.001500	.000100	.....	.....	
9,200	46,000	.001550	.000050	.....	.....	
9,400	47,000	.001550	0.	.....	.....	
9,600	48,000	.001600	.000050	.....	.....	
9,800	49,000	.001650	.000050	.....	.....	
10,000	50,000	.001700	.000050	.....	.....	
10,200	51,000	.001750	.000050	.....	.....	
10,400	52,000	.001850	.000100	.....	.....	Elastic limit.
10,600	53,000	.004650	.002800	.....	.....	
10,800	54,000	.006100	.001450	.....	.....	
11,000	55,000	.007100	.001000	.....	.....	
11,200	56,000	.008100	.001000	.....	.....	
11,400	57,000	.009100	.001000	.....	.....	
11,600	58,000	.010050	.000950	.....	.....	
11,800	59,000	.011000	.000950	.....	.....	
12,000	60,000	.012100	.001100	.....	.....	
12,400	62,000	.014250	.002150	.....	.....	
12,800	64,000	.016350	.002100	.....	.....	
13,200	66,000	.018750	.002400	.....	.....	
13,600	68,000	.021250	.002500	.....	.....	
14,000	70,000	.023500	.002250	.....	.....	
14,400	72,000	.026500	.003000	.....	.....	
14,800	74,000	.029550	.003050	.....	.....	
15,200	76,000	.033000	.003450	.....	.....	
15,600	78,000	.037000	.004000	.....	.....	
16,000	80,000	.040850	.003850	.....	.....	
16,400	82,000	.046500	.005650	.....	.....	
16,800	84,000	.053250	.006750	.....	.....	
17,200	86,000	.061500	.008250	.....	.....	
17,600	88,000	.0750	.0135	.....	.....	
18,000	90,000	.1000	.0250	.....	.....	
18,110	90,550	.1350	.0350	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	90,550
Elastic limit per square inch of original section	do....	52,000
Elongation per inch after rupture	inch..	0.2050
Elongation per inch under strain at elastic limit	do....	.001850
Reduction in diameter at point of rupture	do....	.135
Reduction in area after rupture, per centum of original section		46.2
Position of rupture		1" from neck
Character of broken surface		silky
Elongation of inch sections		".27", ".14

No. 3658.

Marks, $\frac{32\ R_{34}\ T}{M\ T_4\ M}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000150	.000150	0.	.....	
2,000	10,000	.000350	.000200	0.	.....	
3,000	15,000	.000550	.000200	0.	.....	
4,000	20,000	.000750	.000200	0.	.....	
5,000	25,000	.000850	.000100	0.	.....	
6,000	30,000	.001000	.000150	0.	.....	
7,000	35,000	.001200	.000200	0.	.....	
8,000	40,000	.001450	.000250	.000050	.000050	
9,000	45,000	.001650	.000200	.....	.....	Elastic limit.
9,200	46,000	.002900	.001250	.....	.....	
9,400	47,000	.004150	.001250	.....	.....	
9,600	48,000	.005750	.001600	.....	.....	
9,800	49,000	.006500	.000750	.....	.....	
10,000	50,000	.007600	.001100	.....	.....	
10,200	51,000	.008500	.000900	.....	.....	
10,400	52,000	.009250	.000750	.....	.....	
10,600	53,000	.010150	.000900	.....	.....	
10,800	54,000	.011200	.001050	.....	.....	
11,200	56,000	.013700	.002500	.....	.....	
11,600	58,000	.015750	.002050	.....	.....	
12,000	60,000	.018100	.002350	.....	.....	
12,400	62,000	.020500	.002400	.....	.....	
12,800	64,000	.023250	.002750	.....	.....	
13,200	66,000	.025600	.002350	.....	.....	
13,600	68,000	.029250	.003650	.....	.....	
14,000	70,000	.033000	.003750	.....	.....	
14,400	72,000	.037500	.004500	.....	.....	
14,800	74,000	.041500	.004000	.....	.....	
15,200	76,000	.046500	.005000	.....	.....	
15,600	78,000	.053250	.006750	.....	.....	
16,000	80,000	.062050	.008800	.....	.....	
16,400	82,000	.0750	.012950	.....	.....	
16,800	84,000	.1000	.0250	.....	.....	
16,970	84,850	.1300	.0300	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	84,850
Elastic limit per square inch of original section	do....	45,000
Elongation per inch after rupture	inch..	0.2050
Elongation per inch under strain at elastic limit	do....	.001650
Reduction in diameter at point of rupture	do....	.135
Reduction in area after rupture, per centum of original section		46.2
Position of rupture		″.50 from neck
Character of broken surface		silky
Elongation of inch sections		″.32*, ″.09

No. 3591.

Marks, $\frac{32\ R_{ss}\ T}{B\ T;\ M}$
Diameter, ".505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	.....	
2,000	10,000	.000250	.000150	0.	.....	
3,000	15,000	.000450	.000200	0.	.....	
4,000	20,000	.000600	.000150	0.	.....	
5,000	25,000	.000800	.000200	0.	.....	
6,000	30,000	.001000	.000200	0.	.....	
7,000	35,000	.001150	.000150	0.	.....	
8,000	40,000	.001350	.000200	0.	.....	
9,000	45,000	.001500	.000150	.....	.....	
9,200	46,000	.001550	.000050	.....	.....	
9,400	47,000	.001600	.000050	.....	.....	
9,600	48,000	.001650	.000050	.....	.....	Elastic limit.
9,800	49,000	.004500	.002850	.....	.....	
10,000	50,000	.009100	.004600	.....	.....	
10,200	51,000	.010550	.001450	.....	.....	
10,400	52,000	.011900	.001350	.....	.....	
10,600	53,000	.013000	.001100	.....	.....	
10,800	54,000	.014150	.001150	.....	.....	
11,000	55,000	.015050	.000900	.....	.....	
11,200	56,000	.015750	.000700	.....	.....	
11,400	57,000	.016500	.000750	.....	.....	
11,600	58,000	.017500	.001000	.....	.....	
11,800	59,000	.018900	.001400	.....	.....	
12,000	60,000	.021550	.002650	.....	.....	
12,400	62,000	.023250	.001700	.....	.....	
12,800	64,000	.025850	.002600	.....	.....	
13,200	66,000	.028750	.002900	.....	.....	
13,600	68,000	.032500	.003750	.....	.....	
14,000	70,000	.036400	.003900	.....	.....	
14,400	72,000	.040900	.004500	.....	.....	
14,800	74,000	.047000	.006100	.....	.....	
15,200	76,000	.053400	.006400	.....	.....	
15,600	78,000	.061500	.008100	.....	.....	
16,000	80,000	.072750	.011250	.....	.....	
16,400	82,000	.0900	.017250	.....	.....	
16,790	83,950	.1500	.0600	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	83,950
Elastic limit per square inch of original section	do....	48,000
Elongation per inch after rupture	inch..	0.2350
Elongation per inch under strain at elastic limit	do	.001650
Reduction in diameter at point of rupture	do....	.125
Reduction in area after rupture, per centum of original section		43.3
Position of rupture		".55 from neck
Character of broken surface		silky. Opened cracks in surface of stem
Elongation of inch sections		".14, ".33"

No. 3592.

Marks, $\frac{82\ Rs\ T}{B\ T,\ M}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	.....	Initial load.
1,000	5,000	.000150	.000150	0.	.....	
2,000	10,000	.000300	.000150	0.	.....	
3,000	15,000	.000450	.000150	0.	.....	
4,000	20,000	.000650	.000200	0.	.....	
5,000	25,000	.000850	.000200	0.	.....	
6,000	30,000	.001000	.000150	0.	.....	
7,000	35,000	.001200	.000200	0.	.....	
8,000	40,000	.001350	.000150	0.	.....	
9,000	45,000	.001500	.000150	.....	.....	
9,200	46,000	.001600	.000100	.....	.....	Elastic limit.
9,400	47,000	.008250	.006650	.....	.....	
9,600	48,000	.009600	.001350	.....	.....	
9,800	49,000	.010500	.000900	.....	.....	
10,000	50,000	.011050	.000550	.....	.....	
10,200	51,000	.012100	.001050	.....	.....	
10,400	52,000	.013050	.000950	.....	.....	
10,600	53,000	.014050	.001000	.....	.....	
10,800	54,000	.015150	.001100	.....	.....	
11,000	55,000	.016600	.001450	.....	.....	
11,200	56,000	.017850	.001250	.....	.....	
11,600	58,000	.020350	.002500	.....	.....	
12,000	60,000	.023400	.003050	.....	.....	
12,400	62,000	.026500	.003100	.....	.....	
12,800	64,000	.029650	.003150	.....	.....	
13,200	66,000	.033500	.003850	.....	.....	
13,600	68,000	.038250	.004750	.....	.....	
14,000	70,000	.042700	.004450	.....	.....	
14,400	72,000	.048900	.006200	.....	.....	
14,800	74,000	.056250	.007 50	.....	.....	
15,200	76,000	.065750	.009500	.....	.....	
15,600	78,000	.0750	.009250	.....	.....	
16,000	80,000	.0950	.0200	.....	.....	
16,280	81,400	.1550	.0600	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	81,400
Elastic limit per square inch of original section	do....	46,000
Elongation per inch after rupture	inch..	0.2600
Elongation per inch under strain at elastic limit	do....	.001600
Reduction in diameter at point of rupture	do....	.135
Reduction in area after rupture, per centum of original section		46.2
Position of rupture		″.60 from neck
Character of broken surface		silky
Elongation of inch sections		″.35*, ″.17

No. 3593.

Marks, $\frac{33\ \text{Rss T}}{\text{M T, M}}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	.....	
2,000	10,000	.000300	.000200	0.	.....	
3,000	15,000	.000500	.000200	0.	.....	
4,000	20,000	.000650	.000150	0.	.....	
5,000	25,000	.000850	.000200	0.	.....	
6,000	30,000	.001000	.000150	0.	.....	
7,000	35,000	.001200	.000200	0.	.....	
8,000	40,000	.001350	.000150	0.	.....	
9,000	45,000	.001550	.000200	.....	.....	Elastic limit.
9,200	46,000	.004400	.002850	.....	.....	
9,400	47,000	.005450	.001050	.....	.....	
9,600	48,000	.006400	.000950	.....	.....	
9,800	49,000	.007250	.000850	.....	.....	
10,000	50,000	.008350	.001100	.....	.....	
10,200	51,000	.009100	.000750	.....	.....	
10,400	52,000	.010000	.000900	.....	.....	
10,600	53,000	.011000	.001000	.....	.....	
10,800	54,000	.012100	.001100	.....	.....	
11,000	55,000	.013000	.000900	.....	.....	
11,200	56,000	.014200	.001200	.....	.....	
11,600	58,000	.016350	.002150	.....	.....	
12,000	60,000	.018900	.002550	.....	.....	
12,400	62,000	.021650	.002750	.....	.....	
12,800	64,000	.024050	.002400	.....	.....	
13,200	66,000	.027100	.003050	.....	.....	
13,600	68,000	.030350	.003250	.....	.....	
14,000	70,000	.034300	.003950	.....	.....	
14,400	72,000	.038900	.004600	.....	.....	
14,800	74,000	.043750	.004850	.....	.....	
15,200	76,000	.050000	.006250	.....	.....	
15,600	78,000	.057850	.007850	.....	.....	
16,000	80,000	.068750	.010900	.....	.....	
16,400	82,000	.0850	.016250	.....	.....	
16,690	83,450	.1350	.0500	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	83,450
Elastic limit per square inch of original section	do ...	45,000
Elongation per inch after rupture	inch..	0.2250
Elongation per inch under strain at elastic limit	do....	.001550
Reduction in diameter at point of rupture	do....	.145
Reduction in area after rupture, per centum of original section	.....	49.1
Position of rupture		1″.15 from neck
Character of broken surface	.....	silky
Elongation of inch sections		″.27*, ″.18

No. 3594.

Marks, $\frac{32\ R_{88}\ T}{M\ T, M}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000150	.000150	0.	.....	
2,000	10,000	.000300	.000150	0.	.....	
3,000	15,000	.000500	.000200	0.	.....	
4,000	20,000	.000650	.000150	0.	.....	
5,000	25,000	.000850	.000200	0.	.....	
6,000	30,000	.001000	.000150	0.	.....	
7,000	35,000	.001200	.000200	0.	.....	
8,000	40,000	.001400	.000200	0.	.....	
9,000	45,000	.001550	.000150	.....	.....	Elastic limit.
9,200	46,000	.001800	.000250	.....	.....	
9,400	47,000	.003600	.003800	.....	.....	
9,600	48,000	.000750	.001150	.....	.....	
9,800	49,000	.007550	.000800	.....	.....	
10,000	50,000	.008400	.000850	.....	.....	
10,200	51,000	.009350	.000950	.....	.....	
10,400	52,000	.010350	.001000	.....	.....	
10,600	53,000	.011400	.001050	.....	.....	
10,800	54,000	.012400	.001000	.....	.....	
11,000	55,000	.013500	.001100	.....	.....	
11,200	56,000	.014500	.001000	.....	.....	
11,600	58,000	.016500	.002000	.....	.....	
12,000	60,000	.018900	.002400	.....	.....	
12,400	62,000	.021550	.002650	.....	.....	
12,800	64,000	.024100	.002550	.....	.....	
13,200	66,000	.027400	.003300	.....	.....	
13,600	68,000	.030050	.002650	.....	.....	
14,000	70,000	.034000	.003950	.....	.....	
14,400	72,000	.038000	.004000	.....	.....	
14,800	74,000	.043350	.005350	.....	.....	
15,200	76,000	.048000	.004650	.....	.....	
15,600	78,000	.055500	.007500	.....	.....	
16,000	80,000	.064500	.009000	.....	.....	
16,400	82,000	.081250	.016750	.....	.....	
16,800	84,000	.1050	.023750	.....	.....	
16,940	84,700	.1600	.0550	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds	84,700
Elastic limit per square inch of original section	do	45,000
Elongation per inch after rupture	inch	0.2450
Elongation per inch under strain at elastic limit	do	.001550
Reduction in diameter at point of rupture	do	.125
Reduction in area after rupture, per centum of original section		43.3
Position of rupture		″.90 from neck
Character of broken surface		silky
Elongation of inch sections		″.32*, ″.17

No. 3678.

Marks, $\frac{32\ R_M\ T}{B\ T_1\ M}$
Diameter, ".505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000150	.000150	0.		
2,000	10,000	.000300	.000150	0.		
3,000	15,000	.000500	.000200	0.		
4,000	20,000	.000650	.000150	0.		
5,000	25,000	.000800	.000150	0.		
6,000	30,000	.000950	.000150	0.		
7,000	35,000	.001150	.000200	0.		
8,000	40,000	.001300	.000150	0.		
8,200	41,000	.001300	0.			
8,400	42,000	.001350	.000050			
8,600	43,000	.001400	.000050			Elastic limit.
8,800	44,000	.005750	.004350			
9,000	45,000	.008000	.002250			
9,200	46,000	.009000	.001000			
9,400	47,000	.009850	.000850			
9,600	48,000	.010900	.001050			
9,800	49,000	.011900	.001000			
10,000	50,000	.013200	.001300			
10,200	51,000	.014500	.001300			
10,400	52,000	.015500	.001000			
10,800	54,000	.018100	.002600			
11,200	56,000	.020550	.002450			
11,600	58,000	.023000	.002450			
12,000	60,000	.026500	.003500			
12,400	62,000	.030000	.003500			
12,800	64,000	.033500	.003500			
13,200	66,000	.038000	.004500			
13,600	68,000	.042350	.004350			
14,000	70,000	.049000	.006650			
14,400	72,000	.057000	.008000			
14,800	74,000	.0650	.0080			
15,200	76,000	.0850	.0200			
15,600	78,000	.1000	.0150			
16,020	80,100	.1450	.0450			Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	80,100
Elastic limit per square inch of original section	do ..	43,000
Elongation per inch after rupture	inch..	0.2350
Elongation per inch under strain at elastic limit	do....	.001400
Reduction in diameter at point of rupture	do....	.135
Reduction in area after rupture, per centum of original section		46.2
Position of rupture		".85 from neck
Character of broken surface		silky
Elongation of inch sections		".35*, ".16

No. 3679.

Marks, $\frac{32\ R_{36}\ T}{B\ T_2\ M}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	.....	
2,000	10,000	.000250	.000150	0.	.....	
3,000	15,000	.000450	.000200	0.	.....	
4,000	20,000	.000600	.000150	0.	.....	
5,000	25,000	.000750	.000150	0.	.....	
6,000	30,000	.000950	.000200	0.	.....	
7,000	35,000	.001100	.000150	0.	.....	
8,000	40,000	.001250	.000150	0.	.....	
8,200	41,000	.001300	.000050	.....	.....	
8,400	42,000	.001350	.000050	.....	.....	
8,600	43,000	.001400	.000050	.....	.....	Elastic limit.
8,800	44,000	.002750	.001350	.....	.....	
9,000	45,000	.004500	.001750	.....	.....	
9,200	46,000	.007000	.002500	.....	.....	
9,400	47,000	.008500	.001500	.....	.....	
9,600	48,000	.009500	.001000	.....	.....	
9,800	49,000	.009900	.000400	.....	.....	
10,000	50,000	.011250	.001350	.....	.....	
10,400	52,000	.013000	.001750	.....	.....	
10,800	54,000	.015750	.002750	.....	.....	
11,200	56,000	.018500	.002750	.....	.....	
11,600	58,000	.020600	.002100	.....	.....	
12,000	60,000	.023150	.002550	.....	.....	
12,400	62,000	.026300	.003150	.....	.....	
12,800	64,000	.029000	.002700	.....	.....	
13,200	66,000	.032600	.003600	.....	.....	
13,600	68,000	.036400	.003800	.....	.....	
14,000	70,000	.0419.0	.005500	.....	.....	
14,400	72,000	.046500	.004600	.....	.....	
14,800	74,000	.053000	.006500	.....	.....	
15,200	76,000	.061000	.008000	.....	.....	
15,600	78,000	.0700	.0090	.....	.....	
16,000	80,000	.0900	.0200	.....	.....	
16,390	81,950	.1550	.0650	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds	81,950
Elastic limit per square inch of original section	do	43,000
Elongation per inch after rupture	inch	0.2550
Elongation per inch under strain at elastic limit	do	.001400
Reduction in diameter at point of rupture	do	.115
Reduction in area after rupture, per centum of original section		40.3
Position of rupture		1″.25 from neck
Character of broken surface		silky
Elongation of inch sections		″.28*, ″.23

No. 3680.

Marks, $\frac{32\ R_{66}\ T}{M\ T_1\ M}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	.....	
2,000	10,000	.000300	.000200	0.	.....	
3,000	15,000	.000450	.000150	0.	.....	
4,000	20,000	.000600	.000150	0.	.....	
5,000	25,000	.000750	.000150	0.	.....	
6,000	30,000	.000950	.000200	0.	.....	
7,000	35,000	.001100	.000150	0.	.....	
8,000	40,000	.001250	.000150	0.	.....	
8,200	41,000	.001300	.000050	.....	.....	
8,400	42,000	.001300	0.	.....	.....	
8,600	43,000	.001350	.000050	.....	.....	
8,800	44,000	.001400	.000050	.....	.....	
9,000	45,000	.001450	.000050	.....	.....	
9,200	46,000	.001450	0.	.....	.....	
9,400	47,000	.001500	.000050	.....	.....	
9,600	48,000	.001550	.000050	.....	.....	Elastic limit.
9,800	49,000	.003000	.001450	.....	.....	
10,000	50,000	.005850	.002850	.....	.....	
10,200	51,000	.008000	.002150	.....	.....	
10,400	52,000	.009500	.001500	.....	.....	
10,600	53,000	.010500	.001000	.....	.....	
10,800	54,000	.011900	.001400	.....	.....	
11,200	56,000	.013650	.001750	.....	.....	
11,600	58,000	.015550	.001900	.....	.....	
12,000	60,000	.018050	.002500	.....	.....	
12,400	62,000	.021250	.003200	.....	.....	
12,800	64,000	.024000	.002750	.....	.....	
13,200	66,000	.026400	.002400	.....	.....	
13,600	68,000	.030000	.003600	.....	.....	
14,000	70,000	.034250	.004250	.....	.....	
14,400	72,000	.038750	.004500	.....	.....	
14,800	74,000	.042900	.004150	.....	.....	
15,200	76,000	.049250	.006350	.....	.....	
15,600	78,000	.058000	.008750	.....	.....	
16,000	80,000	.068250	.010250	.....	.....	
16,400	82,000	.0850	.016750	.....	.....	
16,800	84,000	.1150	.0300	.....	.....	
16,900	84,500	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	84,500
Elastic limit per square inch of original section	do....	48,000
Elongation per inch after rupture	inch..	0.2450
Elongation per inch under strain at elastic limit	do....	.001550
Reduction in diameter at point of rupture	do....	.125
Reduction in area after rupture, per centum of original section		43.3
Position of rupture		1″.10 from neck
Character of broken surface		silky
Elongation of inch sections		″.28*, ″.21

No. 3681.

Marks, $\frac{32\ \text{Res}\ T}{M\ T_2\ M}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000150	.000150	0.	.....	
2,000	10,000	.000300	.000150	0.	.....	
3,000	15,000	.000500	.000200	0.	.....	
4,000	20,000	.000650	.000150	0.	.....	
5,000	25,000	.000800	.000150	0.	.....	
6,000	30,000	.000950	.000150	0.	.....	
7,000	35,000	.001150	.000200	0.	.....	
8,000	40,000	.001300	.000150	0.	.....	
9,000	45,000	.001400	.000100	.....	.....	
9,200	46,000	.001450	.000050	.....	.....	
9,400	47,000	.001500	.000050	.....	.....	Elastic limit.
9,600	48,000	.001700	.000200	.....	.....	
9,800	49,000	.005850	.004150	.....	.....	
10,000	50,000	.009750	.003900	.....	.....	
10,200	51,000	.010900	.001150	.....	.....	
10,400	52,000	.011900	.001000	.....	.....	
10,600	53,000	.013500	.001600	.....	.....	
10,800	54,000	.014250	.000750	.....	.....	
11,200	56,000	.017000	.002750	.....	.....	
11,600	58,000	.019000	.002000	.....	.....	
12,000	60,000	.021400	.002400	.....	.....	
12,400	62,000	.024000	.002600	.....	.....	
12,800	64,000	.027500	.003500	.....	.....	
13,200	66,000	.031000	.003500	.....	.....	
13,600	68,000	.034500	.003500	.....	.....	
14,000	70,000	.038750	.004250	.....	.....	
14,400	72,000	.044500	.005750	.....	.....	
14,800	74,000	.051000	.006500	.....	.....	
15,200	76,000	.059250	.008250	.....	.....	
15,600	78,000	.0700	.010750	.....	.....	
16,000	80,000	.0850	.0150	.....	.....	
16,380	81,900	.1250	.0400	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	81,900
Elastic limit per square inch of original section	do....	47,000
Elongation per inch after rupture	inch..	0.2000
Elongation per inch under strain at elastic limit	do....	.001500
Reduction in diameter at point of rupture	do....	.135
Reduction in area after rupture, per centum of original section		46.2
Position of rupture		″.60 from neck
Character of broken surface		silky
Elongation of inch sections		″.31*, ″.09

No. 3625.

Marks, $\frac{32\ R_{ev}\ T}{B\ T_1\ M}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads. Total.	Applied loads. Per square inch.	Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000150	.000150	0.	.....	
2,000	10,000	.000350	.000200	0.	.....	
3,000	15,000	.000500	.000150	0.	.....	
4,000	20,000	.000650	.000150	0.	.....	
5,000	25,000	.000800	.000150	0.	.....	
6,000	30,000	.000950	.000150	0.	.....	
7,000	35,000	.001150	.000200	0.	.....	
8,000	40,000	.001300	.000150	0.	.....	
9,000	45,000	.001500	.000200	.....	.....	
9,200	46,000	.001550	.000050	.....	.....	
9,400	47,000	.001550	0.	.....	.....	Elastic limit.
9,600	48,000	.001700	.000150	.....	.....	
9,800	49,000	.002100	.000400	.....	.....	
10,000	50,000	.005000	.002900	.....	.....	
10,200	51,000	.006100	.001100	.....	.....	
10,400	52,000	.007100	.001000	.....	.....	
10,600	53,000	.008000	.000900	.....	.....	
10,800	54,000	.009000	.001000	.....	.....	
11,200	56,000	.010900	.001900	.....	.....	
11,600	58,000	.013000	.002100	.....	.....	
12,000	60,000	.015050	.002050	.....	.....	
12,400	62,000	.017300	.002250	.....	.....	
12,800	64,000	.019500	.002200	.....	.....	
13,200	66,000	.021800	.002300	.....	.....	
13,600	68,000	.024250	.002450	.....	.....	
14,000	70,000	.027000	.002750	.....	.....	
14,400	72,000	.030350	.003350	.....	.....	
14,800	74,000	.033900	.003550	.....	.....	
15,200	76,000	.037750	.003850	.....	.....	
15,600	78,000	.041900	.004150	.....	.....	
16,000	80,000	.047300	.005400	.....	.....	
16,400	82,000	.053900	.006600	.....	.....	
16,800	84,000	.063500	.009600	.....	.....	
17,200	86,000	.0800	.0165	.....	.....	
17,600	88,000	.1000	.0200	.....	.....	
17,780	88,900	.1400	.0400	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	88,900
Elastic limit per square inch of original section	do...	47,000
Elongation per inch after rupture	inch..	0.2200
Elongation per inch under strain at elastic limit	do...	.001550
Reduction in diameter at point of rupture	do...	.125
Reduction in area after rupture, per centum of original section		43.3
Position of rupture		″.70 from neck
Character of broken surface		silky
Elongation of inch sections		″.12, ″.32*

No. 3626.

Marks, $\frac{32\ B_W\ T}{B\ T_S\ M}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000150	.000150	0.	.....	
2,000	10,000	.000300	.000150	0.	.....	
3,000	15,000	.000500	.000200	0.	.....	
4,000	20,000	.000650	.000150	0.	.....	
5,000	25,000	.000800	.000150	0.	.....	
6,000	30,000	.000950	.000150	0.	.....	
7,000	35,000	.001100	.000150	0.	.....	
8,000	40,000	.001300	.000200	0.	.....	
9,000	45,000	.001500	.000200	.....	.....	
9,200	46,000	.001550	.000050	.....	.....	
9,400	47,000	.001600	.000050	.....	.....	
9,600	48,000	.001650	.000050	.....	.....	Elastic limit.
9,800	49,000	.003000	.001350	.....	.....	
10,000	50,000	.003650	.000650	.....	.....	
10,200	51,000	.005200	.001550	.....	.....	
10,400	52,000	.006400	.001200	.....	.....	
10,600	53,000	.008000	.001600	.....	.....	
10,800	54,000	.008750	.000750	.....	.....	
11,000	55,000	.009650	.000900	.....	.....	
11,200	56,000	.010900	.001250	.....	.....	
11,600	58,000	.013750	.002850	.....	.....	
12,000	60,000	.015200	.001450	.....	.....	
12,400	62,000	.017400	.002200	.....	.....	
12,800	64,000	.019600	.002200	.....	.....	
13,200	66,000	.022050	.002450	.....	.....	
13,600	68,000	.025100	.003050	.....	.....	
14,000	70,000	.028000	.002900	.....	.....	
14,400	72,000	.031000	.003000	.....	.....	
14,800	74,000	.035000	.004000	.....	.....	
15,200	76,000	.039750	.004750	.....	.....	
15,600	78,000	.044650	.004900	.....	.....	
16,000	80,000	.050000	.005350	.....	.....	
16,400	82,000	.058500	.008500	.....	.....	
16,800	84,000	.0650	.0065	.....	.....	
17,200	86,000	.0900	.0250	.....	.....	
17,520	87,600	.1350	.0450	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	87,600
Elastic limit per square inch of original section	do....	48,000
Elongation per inch after rupture	inch..	0.2150
Elongation per inch under strain at elastic limit	do....	.001653
Reduction in diameter at point of rupture	do....	.125
Reduction in area after rupture, per centum of original section		43.3
Position of rupture		″.65 from neck
Character of broken surface		silky
Elongation of inch sections		″.11, ″.32*

No. 3627.

Marks, $\frac{32\ Rw\ T}{M\ T_1\ M}$
Diameter, ".505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	Pounds.	Inch.	Inch.	Inch.	Inch.	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000150	.000150	0.		
2,000	10,000	.000300	.000150	0.		
3,000	15,000	.000500	.000200	0.		
4,000	20,000	.000650	.000150	0.		
5,000	25,000	.000800	.000150	0.		
6,000	30,000	.000950	.000150	0.		
7,000	35,000	.001100	.000150	0.		
8,000	40,000	.001300	.000200	0.		
8,200	41,000	.001350	.000050			
8,400	42,000	.001400	.000050			
8,600	43,000	.001500	.000100			Elastic limit.
8,800	44,000	.003350	.001850			
9,000	45,000	.005400	.002050			
9,200	46,000	.006500	.001100			
9,400	47,000	.007400	.000900			
9,600	48,000	.008500	.001100			
9,800	49,000	.009350	.000850			
10,000	50,000	.010550	.001200			
10,400	52,000	.012700	.002150			
10,800	54,000	.015100	.002400			
11,200	56,000	.017300	.002200			
11,600	58,000	.019900	.002600			
12,000	60,000	.022550	.002650			
12,400	62,000	.025550	.003000			
12,800	64,000	.028750	.003200			
13,200	66,000	.032000	.003250			
13,600	68,000	.036250	.004250			
14,000	70,000	.040850	.004600			
14,400	72,000	.047000	.006150			
14,800	74,000	.054000	.007000			
15,200	76,000	.063400	.009400			
15,600	78,000	.0800	.0166			
16,000	80,000	.1000	.0200			
16,140	80,700	.1400	.0400			Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	80,700
Elastic limit per square inch of original section	do....	43,000
Elongation per inch after rupture	inch..	0.2500
Elongation per inch under strain at elastic limit	do....	.001500
Reduction in diameter at point of rupture	do....	.145
Reduction in area after rupture, per centum of original section		49.1
Position of rupture		".95 from neck
Character of broken surface		silky
Elongation of inch sections		".37", ".13

No. 3628.

Marks, $\frac{32\ R_{37}\ T}{M\ T_3\ M}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000150	.000150	0.	.....	
2,000	10,000	.000300	.000150	0.	.....	
3,000	15,000	.000500	.000200	0.	.....	
4,000	20,000	.000700	.000200	0.	.....	
5,000	25,000	.000850	.000150	0.	.....	
6,000	30,000	.001000	.000150	0.	.....	
7,000	35,000	.001150	.000150	0.	.....	
8,000	40,000	.001350	.000200	0.	.....	
8,200	41,000	.001400	.000050	.....	.....	
8,400	42,000	.001400	0.	.....	.....	
8,600	43,000	.001450	.000050	.....	.....	
8,800	44,000	.001550	.000100	.....	.....	Elastic limit.
9,000	45,000	.002350	.000800	.....	.....	
9,200	46,000	.004150	.001800	.....	.....	
9,400	47,000	.005250	.001100	.....	.....	
9,600	48,000	.006550	.001300	.....	.....	
9,800	49,000	.007500	.000950	.....	.....	
10,000	50,000	.008300	.000800	.....	.....	
10,400	52,000	.011000	.002700	.....	.....	
10,800	54,000	.012850	.001850	.....	.....	
11,200	56,000	.015100	.002250	.....	.....	
11,600	58,000	.017350	.002250	.....	.....	
12,000	60,000	.019600	.002250	.....	.....	
12,400	62,000	.022250	.002650	.....	.....	
12,800	64,000	.025000	.002750	.....	.....	
13,200	66,000	.027850	.002850	.....	.....	
13,600	68,000	.031300	.003450	.....	.....	
14,000	70,000	.035500	.004200	.....	.....	
14,400	72,000	.040000	.004500	.....	.....	
14,800	74,000	.045350	.005350	.....	.....	
15,200	76,000	.051900	.006550	.....	.....	
15,600	78,000	.061250	.009350	.....	.....	
16,000	80,000	.073250	.012000	.....	.....	
16,400	82,000	.0950	.021750	.....	.....	
16,590	82,950	.1300	.0350	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	82,950
Elastic limit per square inch of original section	do	44,000
Elongation per inch after rupture	inch..	0.2250
Elongation per inch under strain at elastic limit	do	.001550
Reduction in diameter at point of rupture	do	.145
Reduction in area after rupture, per centum of original section		49.1
Position of rupture		″.55 from neck
Character of broken surface		silky
Elongation of inch sections		″.34*, ″.11

No. 3629.

Marks, $\frac{22\ Rm\ T}{B\ T,\ M}$
Diameter, ″.503.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000150	.000150	0.		
2,000	10,000	.000350	.000200	0.		
3,000	15,000	.000550	.000200	0.		
4,000	20,000	.000700	.000150	0.		
5,000	25,000	.000850	.000150	0.		
6,000	30,000	.001000	.000150	0.		
7,000	35,000	.001200	.000200	0.		
8,000	40,000	.001400	.000200	0.		
9,000	45,000	.001500	.000100			Elastic limit.
9,200	46,000	.006000	.004500			
9,400	47,000	.007550	.001550			
9,600	48,000	.008300	.000750			
9,800	49,000	.009600	.001300			
10,000	50,000	.010850	.001250			
10,400	52,000	.012800	.001950			
10,800	54,000	.015250	.002450			
11,200	56,000	.017750	.002500			
11,600	58,000	.020350	.002600			
12,000	60,000	.023250	.002900			
12,400	62,000	.026400	.003150			
12,800	64,000	.029900	.003500			
13,200	66,000	.033500	.003600			
13,600	68,000	.038250	.004750			
14,000	70,000	.043500	.005250			
14,400	72,000	.050250	.006750			
14,800	74,000	.058000	.007750			
15,200	76,000	.067750	.009750			
15,600	78,000	.0900	.022250			
16,000	80,000	.1250	.0350			Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	80,000
Elastic limit per square inch of original section	do ...	45,000
Elongation per inch after rupture	inch..	0.1600
Elongation per inch under strain at elastic limit	do....	.001500
Reduction in diameter at point of rupture	do ...	.163
Reduction in area after rupture, per centum of original section		23.9
Position of rupture		1″.05 from neck
Character of broken surface, granular; flaky spot at circumference. Opened cracks in surface of stem		
Elongation of inch sections		″.18*, ″.10

No. 3630.

Marks, $\frac{32\,R_{32}\,T}{B\,T_2\,M}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000150	.000150	0.	.....	
2,000	10,000	.000300	.000150	0.	.....	
3,000	15,000	.000450	.000150	0.	.....	
4,000	20,000	.000600	.000150	0.	.....	
5,000	25,000	.000800	.000200	0.	.....	
6,000	30,000	.001000	.000200	0.	.....	
7,000	35,000	.001150	.000150	0.	.....	
8,000	40,000	.001300	.000150	0.	.....	
8,200	41,000	.001350	.000050	.....	.....	
8,400	42,000	.001400	.000050	.....	.....	
8,600	43,000	.001450	.000050	.....	.....	
8,800	44,000	.001450	0.	.....	.....	Elastic limit.
9,000	45,000	.003500	.002050	.....	.....	
9,200	46,000	.007050	.003550	.....	.....	
9,400	47,000	.008350	.001300	.....	.....	
9,600	48,000	.009500	.001150	.....	.....	
9,800	49,000	.010500	.001000	.....	.....	
10,000	50,000	.012000	.001500	.....	.....	
10,400	52,000	.014000	.002000	.....	.....	
10,800	54,000	.015400	.001400	.....	.....	
11,200	56,000	.017550	.002150	.....	.....	
11,600	58,000	.020300	.002750	.....	.....	
12,000	60,000	.023250	.002950	.....	.....	
12,400	62,000	.025750	.002500	.....	.....	
12,800	64,000	.028900	.003150	.....	.....	
13,200	66,000	.032600	.003700	.....	.....	
13,600	68,000	.037150	.004550	.....	.....	
14,000	70,000	.042500	.005350	.....	.....	
14,400	72,000	.048750	.006250	.....	.....	
14,800	74,000	.054500	.005750	.....	.....	
15,200	76,000	.063750	.009250	.....	.....	
15,600	78,000	.0800	.016250	.....	.....	
16,000	80,000	.1000	.0200	.....	.....	
16,250	81,250	.1450	.0450	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section ..... pounds .. 81,25
Elastic limit per square inch of original section ..... do ... 44,00
Elongation per inch after rupture ..... inch .. 0.200
Elongation per inch under strain at elastic limit ..... do .... .00145
Reduction in diameter at point of rupture ..... do .... .07
Reduction in area after rupture, per centum of original section ..... 27.
Position of rupture ..... 1″.05 from nec
Character of broken surface, granular, 60 per cent.; dull flaky, 40 per cent. Opened cracks in surfac of stem.
Elongation of inch sections ..... ″.22*, ″.1

No. 3631.

Marks, $\frac{33\ K_{33}\ T}{M\ T_1\ M}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.		
2,000	10,000	.000250	.000150	0.		
3,000	15,000	.000450	.000200	0.		
4,000	20,000	.000600	.000150	0.		
5,000	25,000	.000750	.000150	0.		
6,000	30,000	.000950	.000200	0.		
7,000	35,000	.001100	.000150	0.		
8,000	40,000	.001250	.000150	0.		
9,000	45,000	.001500	.000250			
9,200	46,000	.001600	.000100			Elastic limit.
9,400	47,000	.002550	.000950			
9,600	48,000	.003600	.001050			
9,800	49,000	.005300	.001700			
10,000	50,000	.006300	.001000			
10,200	51,000	.007350	.001050			
10,400	52,000	.008250	.000900			
10,600	53,000	.009250	.001000			
10,800	54,000	.010300	.001050			
11,200	56,000	.012400	.002100			
11,600	58,000	.014750	.002350			
12,000	60,000	.017200	.002450			
12,400	62,000	.019500	.002300			
12,800	64,000	.022300	.002800			
13,200	66,000	.025150	.002850			
13,600	68,000	.028000	.002850			
14,000	70,000	.031000	.003000			
14,400	72,000	.034750	.003750			
14,800	74,000	.039500	.004750			
15,200	76,000	.044100	.004600			
15,600	78,000	.050000	.005900			
16,000	80,000	.057350	.007350			
16,400	82,000	.0650	.007650			
16,800	84,000	.0900	.0250			
17,100	85,500	.1300	.0400			Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds	85,500
Elastic limit per square inch of original section	do	46,000
Elongation per inch after rupture	inch	0.1600
Elongation per inch under strain at elastic limit	do	.001600
Reduction in diameter at point of rupture	do	.085
Reduction in area after rupture, per centum of original section		30.7
Position of rupture		″.50 from neck
Character of broken surface		granular, 70 per cent.; dull flaky, 30 per cent.
Elongation of inch sections		″.09, ″.23*

No. 3632.

Marks, $\frac{32\ R_2\ T}{M\ T_2\ M}$
Diameter, ".505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000150	.000150	0.		
2,000	10,000	.000300	.000300	0.		
3,000	15,000	.000450	.000150	0.		
4,000	20,000	.000650	.000200	0.		
5,000	25,000	.000800	.000150	0.		
6,000	30,000	.000950	.000150	0.		
7,000	35,000	.001150	.000200	0.		
8,000	40,000	.001350	.000200	.000050	.000050	
9,000	45,000	.001500	.000150			Elastic limit.
9,200	46,000	.002600	.001100			
9,400	47,000	.004000	.001400			
9,600	48,000	.005100	.001100			
9,800	49,000	.006200	.001100			
10,000	50,000	.007 50	.001050			
10,200	51,000	.008250	.001000			
10,400	52,000	.009000	.000750			
10,600	53,000	.009800	.000800			
10,800	54,000	.011000	.001200			
11,200	56,000	.012900	.001900			
11,600	58,000	.015200	.002300			
12,000	60,000	.017550	.002350			
12,400	62,000	.019600	.002050			
12,800	64,000	.022100	.002500			
13,200	66,000	.024650	.002550			
13,600	68,000	.027550	.002900			
14,000	70,000	.030550	.003000			
14,400	72,000	.034500	.003950			
14,800	74,000	.038500	.004000			
15,200	76,000	.043400	.004900			
15,600	78,000	.049000	.005600			
16,000	80,000	.055500	.006500			
16,400	82,000	.064750	.009250			
16,800	84,000	.0800	.015250			
17,200	86,000	.1050	.0250			
17,240	86,200	.1250	.0200			Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds	86,
Elastic limit per square inch of original section	do	45,
Elongation per inch after rupture	inch	0. 1
Elongation per inch under strain at elastic limit	do	.001
Reduction in diameter at point of rupture	do	
Reduction in area after rupture, per centum of original section		4
Position of rupture		".40 from ne
Character of broken surface		sil
Elongation of inch sections		".09, ".

No. 3665.

Marks, $\frac{32\ R_{33}\ T}{B\ T_3\ M}$
Diameter, ".505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total	*Per square inch.*					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	.....	
2,000	10,000	.000250	.000150	0.	.....	
3,000	15,000	.000400	.000150	0.	.....	
4,000	20,000	.000550	.000150	0.	.....	
5,000	25,000	.000700	.000150	0.	.....	
6,000	30,000	.000900	.000200	0.	.....	
7,000	35,000	.001050	.000150	0.	.....	
8,000	40,000	.001200	.000150	0.	.....	
9,000	45,000	.001400	.000200	.....	.....	
9,600	48,000	.001550	.000150	.....	.....	
9,800	49,000	.001600	.000050	.....	.....	Elastic limit.
10,000	50,000	.002750	.001150	.....	.....	
10,200	51,000	.004250	.001500	.....	.....	
10,400	52,000	.005100	.001850	.....	.....	
10,600	53,000	.007400	.001300	.....	.....	
10,800	54,000	.008400	.001000	.....	.....	
11,000	55,000	.009100	.000700	.....	.....	
11,200	56,000	.010050	.000950	.....	.....	
11,400	57,000	.011050	.001000	.....	.....	
11,600	58,000	.012000	.000950	.....	.....	
11,800	59,000	.013050	.001050	.....	.....	
12,000	60,000	.014050	.001000	.....	.....	
12,400	62,000	.016550	.002500	.....	.....	
12,800	64,000	.018550	.002000	.....	.....	
13,200	66,000	.021100	.002550	.....	.....	
13,600	68,000	.023900	.002800	.....	.....	
14,000	70,000	.027000	.003100	.....	.....	
14,400	72,000	.029850	.002850	.....	.....	
14,800	74,000	.033500	.003650	.....	.....	
15,200	76,000	.037350	.003850	.....	.....	
15,600	78,000	.042100	.004750	.....	.....	
16,000	80,000	.047350	.005250	.....	.....	
16,400	82,000	.0545	.007150	.....	.....	
16,800	84,000	.0600	.0055	.....	.....	
17,200	86,000	.0750	.0150	.....	.....	
17,600	88,000	.1000	.0250	.....	.....	
17,710	88,550	.1350	.0350	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	88,550
Elastic limit per square inch of original section	do	49,000
Elongation per inch after rupture	inch..	0.2050
Elongation per inch under strain at elastic limit	do	.001600
Reduction in diameter at point of rupture	do	.095
Reduction in area after rupture, per centum of original section		34.0
Position of rupture		".65 from neck
Character of broken surface		silky serrated; oblique
Elongation of inch sections		".28", ".13

No. 3666.

Marks, $\frac{32\ Rs\ T}{B\ T,\ M}$
Diameter, ".505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	.....	
2,000	10,000	.000250	.000150	0.	.....	
3,000	15,000	.000450	.000200	0.	.....	
4,000	20,000	.000650	.000200	0.	.....	
5,000	25,000	.000850	.000200	0.	.....	
6,000	30,000	.001000	.000150	0.	.....	
7,000	35,000	.001150	.000150	0.	.....	
8,000	40,000	.001300	.000150	0.	.....	
9,000	45,000	.001500	.000200	.....	.....	
9,600	48,000	.001700	.000200	.....	.....	Elastic limit.
9,800	49,000	.002500	.000800	.....	.....	
10,000	50,000	.004000	.001500	.....	.....	
10,200	51,000	.006550	.002550	.....	.....	
10,400	52,000	.007550	.001000	.....	.....	
10,600	53,000	.008400	.000850	.....	.....	
10,800	54,000	.009350	.000950	.....	.....	
11,200	56,000	.011200	.001850	.....	.....	
11,600	58,000	.013400	.002200	.....	.....	
12,000	60,000	.015750	.002350	.....	.....	
12,400	62,000	.017850	.002100	.....	.....	
12,800	64,000	.020250	.002400	.....	.....	
13,200	66,000	.022600	.002350	.....	.....	
13,600	68,000	.025850	.003250	.....	.....	
14,000	70,000	.028350	.002500	.....	.....	
14,400	72,000	.031850	.003500	.....	.....	
14,800	74,000	.035600	.003750	.....	.....	
15,200	76,000	.040050	.004450	.....	.....	
15,600	78,000	.044750	.004700	.....	.....	
16,000	80,000	.051750	.007000	.....	.....	
16,400	82,000	.059700	.007950	.....	.....	
16,800	84,000	.073500	.013800	.....	.....	
17,200	86,000	.089250	.015750	.....	.....	
17,580	87,900	.1450	.055750	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	87,900
Elastic limit per square inch of original section	do....	48,000
Elongation per inch after rupture	inch..	0 2000
Elongation per inch under strain at elastic limit	do....	.001700
Reduction in diameter at point of rupture	do....	.085
Reduction in area after rupture, per centum of original section		30.7
Position of rupture		".95 from neck
Character of broken surface		silky serrated at the center, granular at the circumference
Elongation of inch sections		".25*, ".15

No. 3667.

Marks, $\frac{32\ R_{33}\ T}{M\ T_3\ M}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads. Total.	Applied loads. Per square inch.	Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	.....	
2,000	10,000	.000350	.000250	0.	.....	
3,000	15,000	.000500	.000150	0.	.....	
4,000	20,000	.000650	.000150	0.	.....	
5,000	25,000	.000800	.000150	0.	.....	
6,000	30,000	.000950	.000150	0.	.....	
7,000	35,000	.001150	.000200	0.	.....	
8,000	40,000	.001350	.000200	0.	.....	
9,000	45,000	.001550	.000200	.....	.....	
9,200	46,000	.001600	.000050	.....	.....	
9,400	47,000	.001650	.000050	.....	.....	Elastic limit.
9,600	48,000	.004250	.002600	.....	.....	
9,800	49,000	.005200	.000950	.....	.....	
10,000	50,000	.008200	.003000	.....	.....	
10,200	51,000	.010050	.001850	.....	.....	
10,400	52,000	.011100	.001050	.....	.....	
10,600	53,000	.011900	.000800	.....	.....	
10,800	54,000	.013000	.001100	.....	.....	
11,000	55,000	.014150	.001150	.....	.....	
11,200	56,000	.015400	.001250	.....	.....	
11,600	58,000	.017650	.002250	.....	.....	
12,000	60,000	.020350	.002700	.....	.....	
12,400	62,000	.023150	.002800	.....	.....	
12,800	64,000	.026500	.003350	.....	.....	
13,200	66,000	.029000	.002500	.....	.....	
13,600	68,000	.032900	.003900	.....	.....	
14,000	70,000	.037400	.004500	.....	.....	
14,400	72,000	.042450	.005050	.....	.....	
14,800	74,000	.048500	.006050	.....	.....	
15,200	76,000	.056000	.007500	.....	.....	
15,600	78,000	.065500	.009500	.....	.....	
16,000	80,000	.0820	.0165	.....	.....	
16,400	82,000	.1100	.0280	.....	.....	
16,460	82,300	.1400	.0300	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds	82,300
Elastic limit per square inch of original section	do	47,000
Elongation per inch after rupture	inch	0.2400
Elongation per inch under strain at elastic limit	do	.001650
Reduction in diameter at point of rupture	do	.115
Reduction in area after rupture, per centum of original section		40.3
Position of rupture		″.85 from neck
Character of broken surface		silky serrated
Elongation of inch sections		″.15, ″.33*

No. 3668.

Marks, $\frac{32\ R_{98}\ T}{M\ T_4\ M}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	.....	
2,000	10,000	.000250	.000150	0.	.....	
3,000	15,000	.000450	.000200	0.	.....	
4,000	20,000	.000600	.000150	0.	.....	
5,000	25,000	.000750	.000150	0.	.....	
6,000	30,000	.000950	.000200	0.	.....	
7,000	35,000	.001100	.000150	0.	.....	
8,000	40,000	.001250	.000150	0.	.....	
9,000	45,000	.001450	.000200	.....	.....	
9,200	46,000	.001500	.000050	.....	.....	Elastic limit.
9,400	47,000	.004250	.002750	.....	.....	
9,600	48,000	.007550	.003300	.....	.....	
9,800	49,000	.008400	.000850	.....	.....	
10,000	50,000	.009400	.001000	.....	.....	
10,200	51,000	.010550	.001150	.....	.....	
10,400	52,000	.011550	.001000	.....	.....	
10,600	53,000	.012550	.001000	.....	.....	
10,800	54,000	.013550	.001000	.....	.....	
11,000	55,000	.014750	.001200	.....	.....	
11,200	56,000	.015950	.001200	.....	.....	
11,600	58,000	.018750	.002800	.....	.....	
12,000	60,000	.021250	.002500	.....	.....	
12,400	62,000	.024150	.002900	.....	.....	
12,800	64,000	.027500	.003350	.....	.....	
13,200	66,000	.030750	.003250	.....	.....	
13,600	68,000	.034500	.003750	.....	.....	
14,000	70,000	.039000	.004500	.....	.....	
14,400	72,000	.043750	.004750	.....	.....	
14,800	74,000	.050000	.006250	.....	.....	
15,200	76,000	.057500	.007500	.....	.....	
15,600	78,000	.062900	.005400	.....	.....	
16,000	80,000	.083750	.020850	.....	.....	
16,400	82,000	.1250	.041250	.....	.....	
16,420	82,100	.1400	.0150	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	82,100
Elastic limit per square inch of original section	do....	46,000
Elongation per inch after rupture	inch..	0.2400
Elongation per inch under strain at elastic limit	do....	.001500
Reduction in diameter at point of rupture	do....	.115
Reduction in area after rupture, per centum of original section		40.3
Position of rupture		″.85 from neck
Character of broken surface		silky serrated
Elongation of inch sections		″.16, ″.32*

No. 3584.

Marks, $\frac{32\ R_{\infty}\ T}{B\ T_1\ M}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	−0.	Initial load.
1,000	5,000	.000100	.000100	−.000050	.000050	
2,000	10,000	.000300	.000200	−.000050	0.	
3,000	15,000	.000400	.000100	−.000050	0.	
4,000	20,000	.000550	.000150	−.000050	0.	
5,000	25,000	.000700	.000150	−.000050	0.	
6,000	30,000	.000850	.000150	−.000050	0.	
7,000	35,000	.001050	.000200	−.000050	0.	
8,000	40,000	.001200	.000150	−.000050	0.	
8,200	41,000	.001250	.000050	.....	.....	
8,400	42,000	.001350	.000100	.....	.....	Elastic limit.
8,600	43,000	.002100	.000750	.....	.....	
8,800	44,000	.004100	.002000	.....	.....	
9,000	45,000	.007500	.003400	.....	.....	
9,200	46,000	.009200	.001700	.....	.....	
9,400	47,000	.009900	.000700	.....	.....	
9,600	48,000	.010550	.000650	.....	.....	
9,800	49,000	.011600	.001050	.....	.....	
10,000	50,000	.013250	.001650	.....	.....	
10,400	52,000	.015250	.002000	.....	.....	
10,800	54,000	.017900	.002650	.....	.....	
11,200	56,000	.020750	.002850	.....	.....	
11,600	58,000	.023500	.002750	.....	.....	
12,000	60,000	.027000	.003500	.....	.....	
12,400	62,000	.031000	.004000	.....	.....	
12,800	64,000	.034500	.003500	.....	.....	
13,200	66,000	.039500	.005000	.....	.....	
13,600	68,000	.044500	.005000	.....	.....	
14,000	70,000	.051250	.006750	.....	.....	
14,400	72,000	.060000	.008750	.....	.....	
14,800	74,000	.070000	.0100	.....	.....	
15,200	76,000	.0840	.0140	.....	.....	
15,600	78,000	.1150	.0310	.....	.....	
15,680	78,400	.1500	.0350	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	78,400
Elastic limit per square inch of original section	do....	42,000
Elongation per inch after rupture	inch..	.02400
Elongation per inch under strain at elastic limit	do....	.001350
Reduction in diameter at point of rupture	do....	.125
Reduction in area after rupture, per centum of original section		43.3
Position of rupture		″.65 from neck
Character of broken surface		silky
Elongation of inch sections		″.12, ″.36*

No. 3585.

Marks, $\frac{32\ R_{80}\ T}{B\ T_2\ M}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000150	.000150	0.	.....	
2,000	10,000	.000300	.000150	0.	.....	
3,000	15,000	.000450	.000150	0.	.....	
4,000	20,000	.000600	.000150	0.	.....	
5,000	25,000	.000750	.000150	0.	.....	
6,000	30,000	.000950	.000200	0.	.....	
7,000	35,000	.001150	.000200	0.	.....	
8,000	40,000	.001300	.000150	0.	.....	
8,200	41,000	.001350	.000050	.....	.....	
8,400	42,000	.001400	.000050	.....	.....	
8,600	43,000	.001400	0.	.....	.....	
8,800	44,000	.001500	.000100	.....	.....	Elastic limit.
9,000	45,000	.002150	.000650	.....	.....	
9,200	46,000	.002650	.000500	.....	.....	
9,400	47,000	.005050	.002400	.....	.....	
9,600	48,000	.007000	.001950	.....	.....	
9,800	49,000	.008250	.001250	.....	.....	
10,000	50,000	.009500	.001250	.....	.....	
10,400	52,000	.011500	.002000	.....	.....	
10,800	54,000	.014100	.002600	.....	.....	
11,200	56,000	.016500	.002400	.....	.....	
11,600	58,000	.019000	.002500	.....	.....	
12,000	60,000	.021750	.002750	.....	.....	
12,400	62,000	.025000	.003250	.....	.....	
12,800	64,000	.027750	.002750	.....	.....	
13,200	66,000	.031500	.003750	.....	.....	
13,600	68,000	.035750	.004250	.....	.....	
14,000	70,000	.040000	.004250	.....	.....	
14,400	72,000	.046500	.006500	.....	.....	
14,800	74,000	.053000	.006500	.....	.....	
15,200	76,000	.062000	.009000	.....	.....	
15,600	78,000	.073500	.011500	.....	.....	
16,000	80,000	.0950	.0215	.....	.....	
16,270	81,350	.1400	.0450	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section.....pounds.. 81,350
Elastic limit per square inch of original section.....do.... 44,000
Elongation per inch after rupture.....inch.. 0.1450
Elongation per inch under strain at elastic limit.....do.... .001500
Reduction in diameter at point of rupture.....do.... .035
Reduction in area after rupture, per centum of original section..... 13.2
Position of rupture.....″.90 from neck
Character of broken surface, granular; flaky spot at the circumference. Opened cracks in surface of stem.
Elongation of inch sections.....″.13, ″.16

No. 3586.

Marks, $\frac{32\ Res\ T}{M\ T,\ M}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000150	.000150	0.	.....	
2,000	10,000	.000300	.000150	0.	.....	
3,000	15,000	.000500	.000200	0.	.....	
4,000	20,000	.000700	.000200	0.	.....	
5,000	25,000	.000850	.000150	0.	.....	
6,000	30,000	.001000	.000150	0.	.....	
7,000	35,000	.001200	.000200	0.	.....	
8,000	40,000	.001350	.000150	0.	.....	
9,000	45,000	.001550	.000200	.....	.....	
9,200	46,000	.001600	.000050	.....	.....	
9,400	47,000	.001650	.000050	.....	.....	
9,600	48,000	.001700	.000050	.....	.....	
9,800	49,000	.001750	.000050	.....	.....	
10,000	50,000	.001800	.000050	.....	.....	Elastic limit.
10,200	51,000	.002000	.000200	.....	.....	
10,400	52,000	.002400	.000400	.....	.....	
10,600	53,000	.002750	.000350	.....	.....	
10,800	54,000	.003600	.000850	.....	.....	
11,000	55,000	.005250	.002850	.....	.....	
11,200	56,000	.006100	.001850	.....	.....	
11,600	58,000	.010000	.001900	.....	.....	
12,000	60,000	.011750	.001750	.....	.....	
12,400	62,000	.013900	.002150	.....	.....	
12,800	64,000	.016000	.002100	.....	.....	
13,200	66,000	.017250	.001250	.....	.....	
13,600	68,000	.020000	.002750	.....	.....	
14,000	70,000	.022250	.002250	.....	.....	
14,400	72,000	.025500	.003250	.....	.....	
14,800	74,000	.028100	.002600	.....	.....	
15,200	76,000	.031250	.003150	.....	.....	
15,600	78,000	.035000	.003750	.....	.....	
16,000	80,000	.040500	.005500	.....	.....	
16,400	82,000	.046250	.005750	.....	.....	
16,800	84,000	.055000	.008750	.....	.....	
17,200	86,000	.063250	.008250	.....	.....	
17,600	88,000	.0800	.016750	.....	.....	
17,990	89,950	.1200	.0400	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	89,950
Elastic limit per square inch of original section	do ...	50,000
Elongation per inch after rupture	inch..	0.1350
Elongation per inch under strain at elastic limit	do....	.001800
Reduction in diameter at point of rupture	do....	.045
Reduction in area after rupture, per centum of original section		16.9
Position of rupture		″.65 from neck
Character of broken surface	granular; flaky line of metal. Opened cracks in surface of stem	
Elongation of inch sections		″.15*, ″.12

No. 3587.

Marks, $\frac{32\ R_{20}\ T}{M\ T_2\ M}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000160	.000100	0.	.....	
2,000	10,000	.000300	.000200	0.	.....	
3,000	15,000	.000450	.000150	0.	.....	
4,000	20,000	.000600	.000150	0.	.....	
5,000	25,000	.000800	.000200	0.	.....	
6,000	30,000	.000950	.000150	0.	.....	
7,000	35,000	.001100	.000150	0.	.....	
8,000	40,000	.001250	.000150	0.	.....	
9,000	45,000	.001400	.000150	.....	.....	
10,000	50,000	.001550	.000150	.....	.....	
10,200	51,000	.001600	.000050	.....	.....	Elastic limit.
10,400	52,000	.002300	.000700	.....	.....	
10,600	53,000	.003250	.000950	.....	.....	
10,800	54,000	.004900	.001650	.....	.....	
11,000	55,000	.006400	.001500	.....	.....	
11,200	56,000	.007850	.001450	.....	.....	
11,400	57,000	.009050	.001200	.....	.....	
11,600	58,000	.010500	.001450	.....	.....	
11,800	59,000	.011550	.001050	.....	.....	
12,000	60,000	.012550	.001000	.....	.....	
12,400	62,000	.014250	.001700	.....	.....	
12,800	64,000	.016400	.002150	.....	.....	
13,200	66,000	.019500	.003100	.....	.....	
13,600	68,000	.023000	.003500	.....	.....	
14,000	70,000	.026100	.003100	.....	.....	
14,400	72,000	.029250	.003150	.....	.....	
14,800	74,000	.032250	.003000	.....	.....	
15,200	76,000	.035850	.003600	.....	.....	
15,600	78,000	.039750	.003900	.....	.....	
16,000	80,000	.044900	.005150	.....	.....	
16,400	82,000	.051500	.006600	.....	.....	
16,800	84,000	.060250	.008750	.....	.....	
17,200	86,000	.0750	.014750	.....	.....	
17,520	87,600	.1100	.0350	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds	87,600
Elastic limit per square inch of original section	do	51,000
Elongation per inch after rupture	inch	0.1450
Elongation per inch under strain at elastic limit	do	.001600
Reduction in diameter at point of rupture	do	.075
Reduction in area after rupture, per centum of original section		27.4
Position of rupture		″.75 from neck
Character of broken surface		granular; dull spot at the circumference
Elongation of inch sections		″.06, ″.23*

No. 3633.

Marks, $\frac{32\ Rs\ T}{B\ T,\ M}$
Diameter, .505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	.....	
2,000	10,000	.000250	.000150	0.	.....	
3,000	15,000	.000450	.000200	0.	.....	
4,000	20,000	.000600	.000150	0.	.....	
5,000	25,000	.000800	.000200	0.	.....	
6,000	30,000	.000950	.000150	0.	.....	
7,000	35,000	.001100	.000150	0.	.....	
8,000	40,000	.001300	.000200	0.	.....	
8,200	41,000	.001350	.000050	.....	.....	
8,400	42,000	.001400	.000050	.....	.....	
8,600	43,000	.001450	.000050	.....	.....	
8,800	44,000	.001500	.000050	.....	.....	Elastic limit.
9,000	45,000	.001800	.000300	.....	.....	
9,200	46,000	.002900	.001100	.....	.....	
9,400	47,000	.004000	.001100	.....	.....	
9,600	48,000	.005350	.001350	.....	.....	
9,800	49,000	.006500	.001150	.....	.....	
10,000	50,000	.007600	.001100	.....	.....	
10,400	52,000	.009850	.002250	.....	.....	
10,800	54,000	.012100	.002250	.....	.....	
11,200	56,000	.014250	.002150	.....	.....	
11,600	58,000	.016750	.002500	.....	.....	
12,000	60,000	.019100	.002350	.....	.....	
12,400	62,000	.021900	.002800	.....	.....	
12,800	64,000	.024750	.002850	.....	.....	
13,200	66,000	.027800	.003050	.....	.....	
13,600	68,000	.031000	.003200	.....	.....	
14,000	70,000	.035250	.004250	.....	.....	
14,400	72,000	.040000	.004750	.....	.....	
14,800	74,000	.045350	.005350	.....	.....	
15,200	76,000	.051750	.006400	.....	.....	
15,600	78,000	.060500	.008750	.....	.....	
16,000	80,000	.0780	.0175	.....	.....	
16,400	82,000	.0900	.0120	.....	.....	
16,800	84,000	.1400	.0500	.....	.....	
16,810	84,050	.1700	.0300	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	84,050
Elastic limit per square inch of original section	do....	44,000
Elongation per inch after rupture	inch..	0.2500
Elongation per inch under strain at elastic limit	do....	.001500
Reduction in diameter at point of rupture	do....	.145
Reduction in area after rupture, per centum of original section		49.1
Position of rupture		".50 from neck
Character of broken surface		silky
Elongation of inch sections		".14, ".36*

No. 3634.

Marks, $\frac{32\ R_{20}\ T}{B\ T_4\ M}$
Diameter, ".505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000150	.000150	0.	.....	
2,000	10,000	.000300	.000300	0.	.....	
3,000	15,000	.000450	.000150	0.	.....	
4,000	20,000	.000600	.000150	0.	.....	
5,000	25,000	.000800	.000200	0.	.....	
6,000	30,000	.000950	.000150	0.	.....	
7,000	35,000	.001150	.000200	0.	.....	
8,000	40,000	.001300	.000150	0.	.....	
8,200	41,000	.001350	.000050	.....	.....	
8,400	42,000	.001450	.000100	.....	.....	
8,600	43,000	.001450	0.	.....	.....	
8,800	44,000	.001500	.000050	.....	.....	Elastic limit.
9,000	45,000	.001650	.000150	.....	.....	
9,200	46,000	.002350	.000700	.....	.....	
9,400	47,000	.003500	.001150	.....	.....	
9,600	48,000	.005500	.002000	.....	.....	
9,800	49,000	.007000	.001500	.....	.....	
10,000	50,000	.008000	.001000	.....	.....	
10,200	51,000	.009100	.001100	.....	.....	
10,400	52,000	.010250	.001150	.....	.....	
10,800	54,000	.012100	.001850	.....	.....	
11,200	56,000	.014650	.002550	.....	.....	
11,600	58,000	.017500	.002850	.....	.....	
12,000	60,000	.020600	.003100	.....	.....	
12,400	62,000	.023000	.002400	.....	.....	
12,800	64,000	.025550	.002550	.....	.....	
13,200	66,000	.028850	.003300	.....	.....	
13,600	68,000	.032200	.003350	.....	.....	
14,000	70,000	.036550	.004350	.....	.....	
14,400	72,000	.041900	.005350	.....	.....	
14,800	74,000	.048000	.006100	.....	.....	
15,200	76,000	.055000	.007000	.....	.....	
15,600	78,000	.063250	.008250	.....	.....	
16,000	80,000	.0700	.006750	.....	.....	
16,400	82,000	.1150	.0450	.....	.....	
16,610	83,050	.1500	.0350	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	83,050
Elastic limit per square inch of original section	do....	44,000
Elongation per inch after rupture	inch..	0.2650
Elongation per inch under strain at elastic limit	do	.001500
Reduction in diameter at point of rupture	do....	.155
Reduction in area after rupture, per centum of original section		51.9
Position of rupture		".80 from neck
Character of broken surface		silky
Elongation of inch sections		.15, ".38*

No. 3635.

Marks, $\frac{32\ R_{33}\ T}{M\ T_2\ M}$
Diameter, ".505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000150	.000150	0.	.....	
2,000	10,000	.000350	.000200	0.	.....	
3,000	15,000	.000550	.000200	0.	.....	
4,000	20,000	.000700	.000150	0.	.....	
5,000	25,000	.000850	.000150	0.	.....	
6,000	30,000	.001000	.000150	0.	.....	
7,000	35,000	.001150	.000150	0.	.....	
8,000	40,000	.001300	.000150	0.	.....	
8,200	41,000	.001350	.000050	.....	.....	
8,400	42,000	.001400	.000050	.....	.....	
8,600	43,000	.001400	0.	.....	.....	
8,800	44,000	.001500	.000100	.....	.....	Elastic limit.
9,000	45,000	.002900	.001400	.....	.....	
9,200	46,000	.006800	.003900	.....	.....	
9,400	47,000	.007600	.000800	.....	.....	
9,600	48,000	.009250	.001650	.....	.....	
9,800	49,000	.009900	.000650	.....	.....	
10,000	50,000	.011350	.001450	.....	.....	
10,400	52,000	.013650	.002300	.....	.....	
10,800	54,000	.016000	.002350	.....	.....	
11,200	56,000	.019000	.003000	.....	.....	
11,600	58,000	.021850	.002850	.....	.....	
12,000	60,000	.024850	.003000	.....	.....	
12,400	62,000	.027500	.002650	.....	.....	
12,800	64,000	.030750	.003250	.....	.....	
13,200	66,000	.035000	.004250	.....	.....	
13,600	68,000	.039000	.004000	.....	.....	
14,000	70,000	.044800	.005800	.....	.....	
14,400	72,000	.051750	.006950	.....	.....	
14,800	74,000	.059000	.007250	.....	.....	
15,200	76,000	.071000	.012000	.....	.....	
15,600	78,000	.086250	.015250	.....	.....	
16,000	80,000	.1300	.043750	.....	.....	
16,080	80,400	.1550	.0250	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	80,400
Elastic limit per square inch of original section	do....	44,000
Elongation per inch after rupture	inch..	0.2650
Elongation per inch under strain at elastic limit	do....	.001500
Reduction in diameter at point of rupture	do....	.135
Reduction in area after rupture, per centum of original section		46.2
Position of rupture		1".15 from neck
Character of broken surface		silky
Elongation of inch sections		".21, ".32"

No. 3636.

Marks, $\frac{32\ R_{30}\ T}{M\ T_4\ M}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000150	.000150	0.	.....	
2,000	10,000	.000250	.000100	0.	.....	
3,000	15,000	.000400	.000150	0.	.....	
4,000	20,000	.000600	.000200	0.	.....	
5,000	25,000	.000800	.000200	0.	.....	
6,000	30,000	.000950	.000150	0.	.....	
7,000	35,000	.001150	.000200	0.	.....	
8,000	40,000	.001300	.000150	0.	.....	
9,000	45,000	.001450	.000150	.....	.....	Elastic limit.
9,200	46,000	.006500	.005050	.....	.....	
9,400	47,000	.007450	.000950	.....	.....	
9,600	48,000	.008250	.000800	.....	.....	
9,800	49,000	.009500	.001250	.....	.....	
10,000	50,000	.010950	.001450	.....	.....	
10,400	52,000	.012750	.001800	.....	.....	
10,800	54,000	.015250	.002500	.....	.....	
11,200	56,000	.018000	.002750	.....	.....	
11,600	58,000	.020250	.002250	.....	.....	
12,000	60,000	.022600	.002350	.....	.....	
12,400	62,000	.026250	.003650	.....	.....	
12,800	64,000	.029250	.003000	.....	.....	
13,200	66,000	.032750	.003500	.....	.....	
13,600	68,000	.037500	.004750	.....	.....	
14,000	70,000	.042750	.005250	.....	.....	
14,400	72,000	.048500	.005750	.....	.....	
14,800	74,000	.054500	.006000	.....	.....	
15,200	76,000	.063750	.009250	.....	.....	
15,600	78,000	.0800	.016250	.....	.....	
16,000	80,000	.1000	.0200	.....	.....	
16,200	81,000	.1500	.0500	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds	81,000
Elastic limit per square inch of original section	do	45,000
Elongation per inch after rupture	inch	0.2550
Elongation per inch under strain at elastic limit	do	.001450
Reduction in diameter at point of rupture	do	.135
Reduction in area after rupture, per centum of original section		46.2
Position of rupture		″.80 from neck
Character of broken surface		silky
Elongation of inch sections		″.36*, ″.15

No. 3611.

Marks, $\frac{32\ R_{60}\ T}{B\ T_1\ M}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads. Total.	Applied loads. Per square inch.	Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000150	.000150	0.	.....	
2,000	10,000	.000300	.000150	0.	.....	
3,000	15,000	.000500	.000200	0.	.....	
4,000	20,000	.000650	.000150	0.	.....	
5,000	25,000	.000850	.000200	0.	.....	
6,000	30,000	.001000	.000150	0.	.....	
7,000	35,000	.001150	.000150	0.	.....	
8,000	40,000	.001350	.000200	0.	.....	
9,000	45,000	.001500	.000150	.....	.....	
9,800	49,000	.001600	.000100	.....	.....	
10,000	50,000	.001700	.000100	.....	.....	Elastic limit.
10,200	51,000	.004500	.002800	.....	.....	
10,400	52,000	.007000	.002500	.....	.....	
10,600	53,000	.008000	.001000	.....	.....	
10,800	54,000	.009000	.001000	.....	.....	
11,000	55,000	.010000	.001000	.....	.....	
11,200	56,000	.011050	.001050	.....	.....	
11,400	57,000	.012150	.001100	.....	.....	
11,600	58,000	.013400	.001250	.....	.....	
11,800	59,000	.014400	.001000	.....	.....	
12,000	60,000	.015600	.001200	.....	.....	
12,400	62,000	.017850	.002250	.....	.....	
12,800	64,000	.020550	.002700	.....	.....	
13,200	66,000	.023250	.002700	.....	.....	
13,600	68,000	.026000	.002750	.....	.....	
14,000	70,000	.028950	.002950	.....	.....	
14,400	72,000	.032650	.003700	.....	.....	
14,800	74,000	.037000	.004350	.....	.....	
15,200	76,000	.041750	.004750	.....	.....	
15,600	78,000	.046600	.004850	.....	.....	
16,000	80,000	.052850	.006250	.....	.....	
16,400	82,000	.062400	.009550	.....	.....	
16,800	84,000	.075500	.013100	.....	.....	
17,200	86,000	.0900	.0145	.....	.....	
17,430	87,150	.1400	.0500	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	87,150
Elastic limit per square inch of original section	do....	50,000
Elongation per inch after rupture	inch..	0.2000
Elongation per inch under strain at elastic limit	do....	.001700
Reduction in diameter at point of rupture	do....	.085
Reduction in area after rupture, per centum of original section		30.7
Position of rupture		″.85 from neck
Character of broken surface		granular; flaky spot at the circumference
Elongation of inch sections		″.27*, ″.13

No. 3612.

Marks, $\frac{32\ R_{40}\ T}{B\ T_2\ M}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	.....	
2,000	10,000	.000300	.000200	0.	.....	
3,000	15,000	.000450	.000150	0.	.....	
4,000	20,000	.000600	.000150	0.	.....	
5,000	25,000	.000750	.000150	0.	.....	
6,000	30,000	.000950	.000200	0.	.....	
7,000	35,000	.001150	.000200	0.	.....	
8,000	40,000	.001300	.000150	0.	.....	
9,000	45,000	.001450	.000150	.....	.....	
9,600	48,000	.001600	.000150	.....	.....	
9,800	49,000	.001650	.000050	.....	.....	Elastic limit.
10,000	50,000	.004250	.002600	.....	.....	
10,200	51,000	.006600	.002350	.....	.....	
10,400	52,000	.007750	.001150	.....	.....	
10,600	53,000	.008750	.001000	.....	.....	
10,800	54,000	.009750	.001000	.....	.....	
11,000	55,000	.010850	.001100	.....	.....	
11,200	56,000	.011850	.001000*	.....	.....	
11,400	57,000	.013000	.001150	.....	.....	
11,600	58,000	.014050	.001050	.....	.....	
11,800	59,000	.015150	.001100	.....	.....	
12,000	60,000	.016400	.001250	.....	.....	
12,400	62,000	.018900	.002500	.....	.....	
12,800	64,000	.021500	.002600	.....	.....	
13,200	66,000	.024250	.002750	.....	.....	
13,600	68,000	.027250	.003000	.....	.....	
14,000	70,000	.030850	.003600	.....	.....	
14,400	72,000	.034750	.003900	.....	.....	
14,800	74,000	.038750	.004000	.....	.....	
15,200	76,000	.043500	.004750	.....	.....	
15,600	78,000	.050000	.006500	.....	.....	
16,000	80,000	.057000	.007000	.....	.....	
16,400	82,000	.067500	.010500	.....	.....	
16,800	84,000	.0850	.0175	.....	.....	
17,200	86,000	.1150	.0300	.....	.....	
17,210	86,050	.1450	.0300	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	86,050
Elastic limit per square inch of original section	do....	49,000
Elongation per inch after rupture	inch..	0.2250
Elongation per inch under strain at elastic limit	do....	.001650
Reduction in diameter at point of rupture	do....	.135
Reduction in area after rupture, per centum of original section		46.2
Position of rupture		″.55 from neck
Character of broken surface		silky
Elongation of inch sections		″.32*, ″.13

No. 3613.

Marks, $\frac{32\ R_{40}\ T}{M\ T_1\ M}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	.....	
2,000	10,000	.000300	.000200	0.	.....	
3,000	15,000	.000400	.000100	0.	.....	
4,000	20,000	.000600	.000200	0.	.....	
5,000	25,000	.000800	.000200	0.	.....	
6,000	30,000	.000950	.000150	0.	.....	
7,000	35,000	.001100	.000150	0.	.....	
8,000	40,000	.001300	.000200	0.	.....	
9,000	45,000	.001500	.000200	.....	.....	
9,200	46,000	.001700	.000200	.....	.....	Elastic limit.
9,400	47,000	.003100	.001400	.....	.....	
9,600	48,000	.004600	.001500	.....	.....	
9,800	49,000	.005650	.001050	.....	.....	
10,000	50,000	.006600	.000950	.....	.....	
10,400	52,000	.008350	.001750	.....	.....	
10,800	54,000	.010600	.002250	.....	.....	
11,200	56,000	.012650	.002050	.....	.....	
11,600	58,000	.014550	.001900	.....	.....	
12,000	60,000	.016500	.001950	.....	.....	
12,400	62,000	.019000	.002500	.....	.....	
12,800	64,000	.021650	.002650	.....	.....	
13,200	66,000	.024150	.002500	.....	.....	
13,600	68,000	.026900	.002750	.....	.....	
14,000	70,000	.029750	.002850	.....	.....	
14,400	72,000	.033500	.003750	.....	.....	
14,800	74,000	.037000	.003500	.....	.....	
15,200	76,000	.042000	.005000	.....	.....	
15,600	78,000	.047500	.005500	.....	.....	
16,000	80,000	.052900	.005400	.....	.....	
16,400	82,000	.061250	.008350	.....	.....	
16,800	84,000	.0710	.009750	.....	.....	
17,200	86,000	.0900	.0190	.....	.....	
17,580	87,900	.1400	.0500	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	87,900
Elastic limit per square inch of original section	do....	46,000
Elongation per inch after rupture	inch..	0.2000
Elongation per inch under strain at elastic limit	do....	.001700
Reduction in diameter at point of rupture	do....	.105
Reduction in area after rupture, per centum of original section		37.1
Position of rupture		″.65 from neck
Character of broken surface	silky, flaky; granular around part of circumference	
Elongation of inch sections		″.29*, ″.11

No. 3614.

Marks, $\frac{10\,R_{10}\,T}{M\,T_2\,M}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000150	.000150	0.	.....	
2,000	10,000	.000350	.000200	0.	.....	
3,000	15,000	.000500	.000150	0.	.....	
4,000	20,000	.000700	.000200	0.	.....	
5,000	25,000	.000850	.000150	0.	.....	
6,000	30,000	.001050	.000200	0.	.....	
7,000	35,000	.001250	.000200	0.	.....	
8,000	40,000	.001400	.000150	.000050	.000050	
8,200	41,000	.001450	.000050	.....	.....	
8,400	42,000	.001550	.000100	.....	.....	Elastic limit.
8,600	43,000	.004750	.003200	.....	.....	
8,800	44,000	.007450	.002700	.....	.....	
9,000	45,000	.008100	.000650	.....	.....	
9,200	46,000	.009100	.001000	.....	.....	
9,400	47,000	.010100	.001000	.....	.....	
9,600	48,000	.011500	.001400	.....	.....	
9,800	49,000	.012500	.001000	.....	.....	
10,000	50,000	.013400	.000900	.....	.....	
10,400	52,000	.015350	.001950	.....	.....	
10,800	54,000	.018100	.002750	.....	.....	
11,200	56,000	.021000	.002900	.....	.....	
11,600	58,000	.023750	.002750	.....	.....	
12,000	60,000	.025850	.002100	.....	.....	
12,400	62,000	.029000	.003150	.....	.....	
12,800	64,000	.033500	.004500	.....	.....	
13,200	66,000	.037000	.003500	.....	.....	
13,600	68,000	.041250	.004250	.....	.....	
14,000	70,000	.045000	.003750	.....	.....	
14,400	72,000	.050500	.005500	.....	.....	
14,800	74,000	.058750	.008250	.....	.....	
15,200	76,000	.067000	.008250	.....	.....	
15,600	78,000	.0750	.0080	.....	.....	
16,000	80,000	.0950	.0200	.....	.....	
16,370	81,850	.1550	.0600	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds	81,850
Elastic limit per square inch of original section	do	42,000
Elongation per inch after rupture	inch	0.2300
Elongation per inch under strain at elastic limit	do	.001550
Reduction in diameter at point of rupture	do	.105
Reduction in area after rupture, per centum of original section		37.1
Position of rupture		″.75 from neck
Character of broken surface		silky, flaky; granular at the circumference
Elongation of inch sections		″.13, ″.33

No. 3647.

Marks, $\frac{32\ R_{60}\ T}{M\ T_3\ M}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000150	.000150	0.	.....	
2,000	10,000	.000300	.000150	0.	.....	
3,000	15,000	.000500	.000200	0.	.....	
4,000	20,000	.000700	.000200	0.	.....	
5,000	25,000	.000850	.000150	0.	.....	
6,000	30,000	.001000	.000150	0.	.....	
7,000	35,000	.001150	.000150	0.	.....	
8,000	40,000	.001350	.000200	0.	.....	
8,200	41,000	.001400	.000050	.....	.....	
8,400	42,000	.001450	.000050	.....	.....	
8,600	43,000	.001500	.000050	.....	.....	Elastic limit.
8,800	44,000	.002100	.000600	.....	.....	
9,000	45,000	.002650	.000550	.....	.....	
9,200	46,000	.004150	.001500	.....	.....	
9,400	47,000	.005500	.001350	.....	.....	
9,600	48,000	.007000	.001500	.....	.....	
9,800	49,000	.008000	.001000	.....	.....	
10,000	50,000	.009500	.001500	.....	.....	
10,400	52,000	.011100	.001600	.....	.....	
10,800	54,000	.013500	.002400	.....	.....	
11,200	56,000	.015850	.002350	.....	.....	
11,600	58,000	.017750	.001900	.....	.....	
12,000	60,000	.020500	.002750	.....	.....	
12,400	62,000	.023100	.002600	.....	.....	
12,800	64,000	.026400	.003300	.....	.....	
13,200	66,000	.029000	.002600	.....	.....	
13,600	68,000	.032000	.003000	.....	.....	
14,000	70,000	.036500	.004500	.....	.....	
14,400	72,000	.041250	.004750	.....	.....	
14,800	74,000	.047000	.005750	.....	.....	
15,200	76,000	.052500	.005500	.....	.....	
15,600	78,000	.061250	.008750	.....	.....	
16,000	80,000	.0700	.008750	.....	.....	
16,400	82,000	.0900	.0200	.....	.....	
16,740	83,700	.1300	.0400	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	83,700
Elastic limit per square inch of original section	do....	43,000
Elongation per inch after rupture	inch..	0.1950
Elongation per inch under strain at elastic limit	do....	.001500
Reduction in diameter at point of rupture	do....	.125
Reduction in area after rupture, per centum of original section	....	43.5
Position of rupture		″.40 from neck
Character of broken surface		silky
Elongation of inch sections		″.09, ″.30*

No. 3648.

Marks, $\frac{32\ R_{e}\ T}{M\ T.\ M}$.
Diameter, ".505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	.....	
2,000	10,000	.000300	.000200	0.	.....	
3,000	15,000	.000450	.000150	0.	.....	
4,000	20,000	.000600	.000150	0.	.....	
5,000	25,000	.000850	.000250	0.	.....	
6,000	30,000	.001000	.000150	0.	.....	
7,000	35,000	.001150	.000150	0.	.....	
8,000	40,000	.001300	.000150	0.	.....	
9,000	45,000	.001500	.000200	.....	.....	
9,200	46,000	.001600	.000100	.....	.....	Elastic limit.
9,400	47,000	.001850	.000250	.....	.....	
9,600	48,000	.002100	.000250	.....	.....	
9,800	49,000	.002400	.000300	.....	.....	
10,000	50,000	.002800	.000400	.....	.....	
10,200	51,000	.003350	.000550	.....	.....	
10,400	52,000	.004900	.001550	.....	.....	
10,600	53,000	.006750	.001850	.....	.....	
10,800	54,000	.007900	.001150	.....	.....	
11,200	56,000	.010150	.002250	.....	.....	
11,600	58,000	.012250	.002100	.....	.....	
12,000	60,000	.014400	.002150	.....	.....	
12,400	62,000	.016550	.002150	.....	.....	
12,800	64,000	.018750	.002200	.....	.....	
13,200	66,000	.021500	.002750	.....	.....	
13,600	68,000	.024050	.002550	.....	.....	
14,000	70,000	.027250	.003200	.....	.....	
14,400	72,000	.031500	.004250	.....	.....	
14,800	74,000	.035550	.004050	.....	.....	
15,200	76,000	.039000	.003450	.....	.....	
15,600	78,000	.042500	.003500	.....	.....	
16,000	80,000	.048750	.006250	.....	.....	
16,400	82,000	.057000	.008250	.....	.....	
16,800	84,000	.065000	.008000	.....	.....	
17,200	86,000	.0800	.0150	.....	.....	
17,570	87,850	.1200	.0400	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds	87,850
Elastic limit per square inch of original section	do	46,000
Elongation per inch after rupture	inch	0.1900
Elongation per inch under strain at elastic limit	do	.001600
Reduction in diameter at point of rupture	do	.105
Reduction in area after rupture, per centum of original section		37.1
Position of rupture		".50 from neck
Character of broken surface		silky; trace of granulation
Elongation of inch sections		".10, ".28"

No. 3649.

Marks, $\frac{32\ R.\ T}{B\ T.\ M}$
Diameter, ".505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000150	.000150	0.		
2,000	10,000	.000300	.000150	0.		
3,000	15,000	.000500	.000200	0.		
4,000	20,000	.000650	.000150	0.		
5,000	25,000	.000850	.000200	0.		
6,000	30,000	.001000	.000150	0.		
7,000	35,000	.001150	.000150	0.		
8,000	40,000	.001350	.000200	0.		
8,200	41,000	.001400	.000050			
8,400	42,000	.001400	0.			
8,600	43,000	.001500	.000100			Elastic limit.
8,800	44,000	.001750	.000250			
9,000	45,000	.002750	.001000			
9,200	46,000	.004500	.001750			
9,400	47,000	.006150	.001650			
9,600	48,000	.007000	.000850			
9,800	49,000	.007900	.000900			
10,000	50,000	.009000	.001100			
10,200	51,000	.010050	.001050			
10,400	52,000	.011000	.000950			
10,600	53,000	.012050	.001050			
10,800	54,000	.013100	.001050			
11,000	55,000	.014150	.001050			
11,200	56,000	.015550	.001400			
11,600	58,000	.017900	.002350			
12,000	60,000	.020800	.002900			
12,400	62,000	.023750	.002950			
12,800	64,000	.027000	.003250			
13,200	66,000	.030000	.003000			
13,600	68,000	.033000	.003000			
14,000	70,000	.037250	.004250			
14,400	72,000	.041850	.004600			
14,800	74,000	.047600	.005750			
15,200	76,000	.059250	.011650			
15,600	78,000	.062600	.003350			
16,000	80,000	.0750	.0124			
16,400	82,000	.0950	.0200			
16,690	83,450	.1500	.0550			Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	83,450
Elastic limit per square inch of original section	do....	43,000
Elongation per inch after rupture	inch..	0.2500
Elongation per inch under strain at elastic limit	do....	.001500
Reduction in diameter at point of rupture	do....	.125
Reduction in area after rupture, per centum of original section		43.3
Position of rupture		".60 from neck
Character of broken surface		silky
Elongation of inch sections		".35*, ".15

No. 3650.

Marks, $\frac{32\ R\ T}{B\ T_4\ M}$
Diameter, ".505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000150	.000150	0.	.....	
2,000	10,000	.000300	.000150	0.	.....	
3,000	15,000	.000450	.000150	0.	.....	
4,000	20,000	.000600	.000150	0.	.....	
5,000	25,000	.000800	.000200	0.	.....	
6,000	30,000	.000950	.000150	0.	.....	
7,000	35,000	.001150	.000200	0.	.....	
8,000	40,000	.001350	.000200	0.	.....	
8,200	41,000	.001400	.000050	.....	.....	
8,400	42,000	.001450	.000050	.....	.....	
8,600	43,000	.001500	.000050	.....	.....	
8,800	44,000	.001600	.000100	.....	.....	Elastic limit.
9,000	45,000	.002550	.000950	.....	.....	
9,200	46,000	.005350	.002800	.....	.....	
9,400	47,000	.006100	.000750	.....	.....	
9,600	48,000	.007000	.000900	.....	.....	
9,800	49,000	.008100	.001100	.....	.....	
10,000	50,000	.009400	.001300	.....	.....	
10,200	51,000	.010050	.000650	.....	.....	
10,400	52,000	.011500	.001450	.....	.....	
10,600	53,000	.012500	.001000	.....	.....	
10,800	54,000	.013500	.001000	.....	.....	
11,200	56,000	.016000	.002500	.....	.....	
11,600	58,000	.018500	.002500	.....	.....	
12,000	60,000	.021000	.002500	.....	.....	
12,400	62,000	.023900	.002900	.....	.....	
12,800	64,000	.026500	.002600	.....	.....	
13,200	66,000	.030000	.003500	.....	.....	
13,600	68,000	.033900	.003900	.....	.....	
14,000	70,000	.039050	.005150	.....	.....	
14,400	72,000	.043500	.004450	.....	.....	
14,800	74,000	.048250	.004750	.....	.....	
15,200	76,000	.058500	.012250	.....	.....	
15,600	78,000	.068250	.009750	.....	.....	
16,000	80,000	.0800	.013750	.....	.....	
16,400	82,000	.1050	.0250	.....	.....	
16,510	82,550	.1500	.0450	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	82,550
Elastic limit per square inch of original section	do....	44,000
Elongation per inch after rupture	inch..	0.1950
Elongation per inch under strain at elastic limit	do....	.001600
Reduction in diameter at point of rupture	do....	.085
Reduction in area after rupture, per centum of original section		30.7
Position of rupture		at middle of stem
Character of broken surface		granular; dull spot at the circumference
Elongation of inch sections		".19*, ".20*

No. 3674.

Marks, $\frac{32\ R_{40}\ T}{B\ T_5\ M}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads. Total.	Applied loads. Per square inch.	Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	.....	
2,000	10,000	.000250	.000150	0.	.....	
3,000	15,000	.000400	.000150	0.	.....	
4,000	20,000	.000500	.000100	0.	.....	
5,000	25,000	.000650	.000150	0.	.....	
6,000	30,000	.000850	.000200	0.	.....	
7,000	35,000	.001050	.000200	0.	.....	
8,000	40,000	.001200	.000150	0.	.....	
9,000	45,000	.001350	.000150	.....	.....	
10,000	50,000	.001600	.000250	.....	.....	
10,200	51,000	.001600	0.	.....	.....	
10,400	52,000	.001650	.000050	.....	.....	
10,600	53,000	.001650	0.	.....	.....	
10,800	54,000	.001700	.000050	.....	.....	
11,000	55,000	.001800	.000100	.....	.....	Elastic limit.
11,200	56,000	.003350	.001550	.....	.....	
11,400	57,000	.006250	.002900	.....	.....	
11,600	58,000	.007300	.001050	.....	.....	
11,800	59,000	.008650	.001350	.....	.....	
12,000	60,000	.010400	.001750	.....	.....	
12,400	62,000	.012500	.002100	.....	.....	
12,800	64,000	.015150	.002650	.....	.....	
13,200	66,000	.017500	.002350	.....	.....	
13,600	68,000	.020300	.002800	.....	.....	
14,000	70,000	.024000	.003700	.....	.....	
14,400	72,000	.027000	.003000	.....	.....	
14,800	74,000	.030500	.003500	.....	.....	
15,200	76,000	.035000	.004500	.....	.....	
15,600	78,000	.040250	.005250	.....	.....	
16,000	80,000	.045850	.005600	.....	.....	
16,400	82,000	.053250	.007400	.....	.....	
16,800	84,000	.063250	.010000	.....	.....	
17,200	86,000	.079000	.015750	.....	.....	
17,470	87,350	.1150	.0360	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	87,350
Elastic limit per square inch of original section	do....	55,000
Elongation per inch after rupture	inch..	0.1900
Elongation per inch under strain at elastic limit	do ...	.001800
Reduction in diameter at point of rupture	do....	.105
Reduction in area after rupture, per centum of original section		37.1
Position of rupture		1″.10 from neck
Character of broken surface		silky serrated
Elongation of inch sections		″.23*, ″.15

No. 3675.

Marks, $\frac{32\ R\ T}{B\ T\ M}$
Diameter, ".505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000150	.000150	0.	.....	
2,000	10,000	.000300	.000150	0.	.....	
3,000	15,000	.000450	.000150	0.	.....	
4,000	20,000	.000650	.000200	0.	.....	
5,000	25,000	.000800	.000150	0.	.....	
6,000	30,000	.000950	.000150	0.	.....	
7,000	35,000	.001100	.000150	0.	.....	
8,000	40,000	.001250	.000150	0.	.....	
9,000	45,000	.001400	.000150	.....	.....	
10,000	50,000	.001550	.000150	.....	.....	
10,200	51,000	.001600	.000050	.....	.....	
10,400	52,000	.001650	.000050	.....	.....	
10,600	53,000	.001750	.000100	.....	.....	Elastic limit.
10,800	54,000	.001950	.000200	.....	.....	
11,000	55,000	.002300	.000350	.....	.....	
11,200	56,000	.003250	.000950	.....	.....	
11,400	57,000	.004200	.000950	.....	.....	
11,600	58,000	.006050	.001850	.....	.....	
11,800	59,000	.007550	.001500	.....	.....	
12,000	60,000	.009050	.001500	.....	.....	
12,400	62,000	.011800	.002750	.....	.....	
12,800	64,000	.014500	.002700	.....	.....	
13,200	66,000	.017500	.003000	.....	.....	
13,600	68,000	.020350	.002850	.....	.....	
14,000	70,000	.023400	.003050	.....	.....	
14,400	72,000	.026500	.003100	.....	.....	
14,800	74,000	.029850	.003350	.....	.....	
15,200	76,000	.033400	.003550	.....	.....	
15,600	78,000	.038250	.004850	.....	.....	
16,000	80,000	.043500	.005250	.....	.....	
16,400	82,000	.050550	.007050	.....	.....	
16,800	84,000	.060050	.009500	.....	.....	
17,200	86,000	.0700	.009950	.....	.....	
17,510	87,550	.1050	.0350	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	87,550
Elastic limit per square inch of original section	do....	53,000
Elongation per inch after rupture	inch..	0.1750
Elongation per inch under strain at elastic limit	do....	.001750
Reduction in diameter at point of rupture	do....	.105
Reduction in area after rupture, per centum of original section		37.1
Position of rupture		".80 from neck
Character of broken surface		granular; silky serrated spot at the circumference
Elongation of inch sections		".09, ".26

No. 3676.

Marks, $\frac{32\ R\ T}{M\ T,\ M}$
Diameter, ".505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	.....	
2,000	10,000	.000250	.000150	0.	.....	
3,000	15,000	.000450	.000200	0.	.....	
4,000	20,000	.000600	.000150	0.	.....	
5,000	25,000	.000750	.000150	0.	.....	
6,000	30,000	.000900	.000150	0.	.....	
7,000	35,000	.001050	.000150	0.	.....	
8,000	40,000	.001200	.000150	0.	.....	
9,000	45,000	.001450	.000250	.....	.....	
10,000	50,000	.001600	.000150	.....	.....	Elastic limit.
10,200	51,000	.001900	.000300	.....	.....	
10,400	52,000	.002450	.000550	.....	.....	
10,600	53,000	.003100	.000650	.....	.....	
10,800	54,000	.004400	.001300	.....	.....	
11,000	55,000	.005550	.001150	.....	.....	
11,200	56,000	.006750	.001200	.....	.....	
11,400	57,000	.007500	.000750	.....	.....	
11,600	58,000	.008850	.001350	.....	.....	
11,800	59,000	.010250	.001400	.....	.....	
12,000	60,000	.011400	.001150	.....	.....	
12,400	62,000	.013150	.001850	.....	.....	
12,800	64,000	.015000	.001750	.....	.....	
13,200	66,000	.017250	.002250	.....	.....	
13,600	68,000	.019800	.002550	.....	.....	
14,000	70,000	.022350	.002550	.....	.....	
14,400	72,000	.025000	.002650	.....	.....	
14,800	74,000	.027850	.002850	.....	.....	
15,200	76,000	.031000	.003150	.....	.....	
15,600	78,000	.035000	.004000	.....	.....	
16,000	80,000	.039000	.004000	.....	.....	
16,400	82,000	.043800	.004800	.....	.....	
16,800	84,000	.049900	.006100	.....	.....	
17,200	86,000	.057100	.007200	.....	.....	
17,600	88,000	.065750	.011650	.....	.....	
18,000	90,000	.0850	.016250	.....	.....	
18,080	90,400	.1050	.0200	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds	90,400
Elastic limit per square inch of original section	do	50,000
Elongation per inch after rupture	inch	0.1700
Elongation per inch under strain at elastic limit	do	.001600
Reduction in diameter at point of rupture	do	.105
Reduction in area after rupture, per centum of original section		37.1
Position of rupture		".60 from neck
Character of broken surface	silky serrated, 40 per cent.; granular, 60 per cent.	
Elongation of inch sections		".07, ".27

No. 3677.

Marks, $\frac{32\ R_{40}\ T}{M\ T_5\ M}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	.....	
2,000	10,000	.000250	.000150	0.	.....	
3,000	15,000	.000450	.000200	0.	.....	
4,000	20,000	.000650	.000200	0.	.....	
5,000	25,000	.000800	.000150	0.	.....	
6,000	30,000	.001000	.000200	0.	.....	
7,000	35,000	.001150	.000150	0.	.....	
8,000	40,000	.001300	.000150	0.	.....	
9,000	45,000	.001450	.000150	.....	.....	
10,000	50,000	.001650	.000200	.....	.....	Elastic limit.
10,200	51,000	.002000	.000350	.....	.....	
10,400	52,000	.002400	.000400	.....	.....	
10,600	53,000	.003050	.000650	.....	.....	
10,800	54,000	.004050	.001000	.....	.....	
11,000	55,000	.005550	.001500	.....	.....	
11,200	56,000	.007250	.001700	.....	.....	
11,400	57,000	.008500	.001250	.....	.....	
11,600	58,000	.009500	.001000	.....	.....	
11,800	59,000	.011000	.001500	.....	.....	
12,000	60,000	.012100	.001100	.....	.....	
12,400	62,000	.014050	.001950	.....	.....	
12,800	64,000	.016350	.002300	.....	.....	
13,200	66,000	.019000	.002650	.....	.....	
13,600	68,000	.021100	.002100	.....	.....	
14,000	70,000	.023900	.002800	.....	.....	
14,400	72,000	.027050	.003150	.....	.....	
14,800	74,000	.030100	.003050	.....	.....	
15,200	76,000	.033750	.003650	.....	.....	
15,600	78,000	.037750	.004000	.....	.....	
16,000	80,000	.042300	.004550	.....	.....	
16,400	82,000	.048850	.006550	.....	.....	
16,800	84,000	.055250	.006400	.....	.....	
17,200	86,000	.064250	.009000	.....	.....	
17,600	88,000	.0750	.010750	.....	.....	
17,980	89,900	.1150	.0400	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds	89,900
Elastic limit per square inch of original section	do	50,000
Elongation per inch after rupture	inch	0.1900
Elongation per inch under strain at elastic limit	do	.001650
Reduction in diameter at point of rupture	do	.125
Reduction in area after rupture, per centum of original section		43.3
Position of rupture		″.45 from neck
Character of broken surface		silky serrated
Elongation of inch sections		″.09, ″.27+

No. 3603.

Marks, $\frac{32\ R_{21}\ T}{B\ T_1\ M}$
Diameter, ".505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000150	.000150	0.		
2,000	10,000	.000300	.000150	0.		
3,000	15,000	.000450	.000150	0.		
4,000	20,000	.000650	.000200	0.		
5,000	25,000	.000850	.000200	0.		
6,000	30,000	.001000	.000150	0.		
7,000	35,000	.001150	.000150	0.		
8,000	40,000	.001350	.000200	0.		
9,000	45,000	.001500	.000150			
9,500	48,000	.001650	.000150			
9,800	49,000	.001700	.000050			
10,000	50,000	.001800	.000100			Elastic limit.
10,200	51,000	.002000	.000200			
10,400	52,000	.002350	.000350			
10,600	53,000	.003100	.000750			
10,800	54,000	.004100	.001000			
11,000	55,000	.004950	.000850			
11,200	56,000	.006250	.001300			
11,400	57,000	.007700	.001450			
11,600	58,000	.008750	.001050			
11,800	59,000	.009900	.001150			
12,000	60,000	.011150	.001250			
12,400	62,000	.013100	.001950			
12,800	64,000	.015250	.002150			
13,200	66,000	.017850	.002600			
13,600	68,000	.020350	.002500			
14,000	70,000	.022750	.002400			
14,400	72,000	.025600	.002750			
14,800	74,000	.028500	.003000			
15,200	76,000	.032050	.003550			
15,600	78,000	.035650	.003600			
16,000	80,000	.040000	.004350			
16,400	82,000	.045000	.005000			
16,800	84,000	.051250	.006250			
17,200	86,000	.058500	.007250			
17,600	88,000	.0650	.0065			
18,000	90,000	.0900	.0250			
18,400	92,000	.1150	.0250			
18,410	92,050	.1300	.0150			Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	92,050
Elastic limit per square inch of original section	do....	50,000
Elongation per inch after rupture	inch..	0.1950
Elongation per inch under strain at elastic limit	do....	.001800
Reduction in diameter at point of rupture	do....	.115
Reduction in area after rupture, per centum of original section		40.3
Position of rupture		".50 from neck
Character of broken surface		silky
Elongation of inch sections		".11, ".28

No. 3604.

Marks, $\frac{32\ R_{41}\ T}{B\ T_2\ M}$
Diameter, ".505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000150	.000150	0.	.....	
2,000	10,000	.000350	.000200	0.	.....	
3,000	15,000	.000550	.000200	0.	.....	
4,000	20,000	.000750	.000200	0.	.....	
5,000	25,000	.000900	.000150	0.	.....	
6,000	30,000	.001050	.000150	0.	.....	
7,000	35,000	.001200	.000150	0.	.....	
8,000	40,000	.001350	.000150	0.	.....	
9,000	45,000	.001500	.000150	.....	.....	
10,000	50,000	.001700	.000200	.....	.....	
10,200	51,000	.001750	.000050	.....	.....	Elastic limit.
10,400	52,000	.002500	.000750	.....	.....	
10,600	53,000	.003500	.001000	.....	.....	
10,800	54,000	.005500	.002000	.....	.....	
11,000	55,000	.007100	.001600	.....	.....	
11,200	56,000	.008500	.001400	.....	.....	
11,400	57,000	.009500	.001000	.....	.....	
11,600	58,000	.010550	.001050	.....	.....	
11,800	59,000	.011400	.000850	.....	.....	
12,000	60,000	.012600	.001200	.....	.....	
12,400	62,000	.015200	.002600	.....	.....	
12,800	64,000	.017550	.002350	.....	.....	
13,200	66,000	.020350	.002800	.....	.....	
13,600	68,000	.022600	.002250	.....	.....	
14,000	70,000	.025350	.002750	.....	.....	
14,400	72,000	.028500	.003150	.....	.....	
14,800	74,000	.031800	.003300	.....	.....	
15,200	76,000	.035750	.003950	.....	.....	
15,600	78,000	.040100	.004350	.....	.....	
16,000	80,000	.045250	.005150	.....	.....	
16,400	82,000	.051750	.006500	.....	.....	
16,800	84,000	.059350	.007600	.....	.....	
17,200	86,000	.0700	.010650	.....	.....	
17,600	88,000	.0950	.0250	.....	.....	
17,860	89,300	.1650	.0700	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	89,300
Elastic limit per square inch of original section	do....	51,000
Elongation per inch after rupture	inch..	0.2350
Elongation per inch under strain at elastic limit	do....	.001750
Reduction in diameter at point of rupture	do....	.125
Reduction in area after rupture, per centum of original section		43.3
Position of rupture		".60 from neck
Character of broken surface		silky
Elongation of inch sections		".13 ".34*

No. 3605.

Marks, $\frac{32 R_{61} T}{M T_1 M}$
Diameter, ".505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	.....	
2,000	10,000	.000300	.000200	0.	.....	
3,000	15,000	.000450	.000150	0.	.....	
4,000	20,000	.000600	.000150	0.	.....	
5,000	25,000	.000750	.000150	0.	.....	
6,000	30,000	.000950	.000200	0.	.....	
7,000	35,000	.001100	.000150	0.	.....	
8,000	40,000	.001300	.000200	0.	.....	
9,000	45,000	.001500	.000200	.....	.....	Elastic limit.
9,200	46,000	.003000	.001500	.....	.....	
9,400	47,000	.005000	.002000	.....	.....	
9,600	48,000	.006650	.001650	.....	.....	
9,800	49,000	.008000	.001350	.....	.....	
10,000	50,000	.008750	.000750	.....	.....	
10,200	51,000	.010000	.001250	.....	.....	
10,400	52,000	.010750	.000750	.....	.....	
10,600	53,000	.011500	.000750	.....	.....	
10,800	54,000	.012850	.001150	.....	.....	
11,000	55,000	.014000	.001350	.....	.....	
11,200	56,000	.015050	.001050	.....	.....	
11,600	58,000	.017500	.002450	.....	.....	
12,000	60,000	.019750	.002250	.....	.....	
12,400	62,000	.022500	.002750	.....	.....	
12,800	64,000	.025750	.003250	.....	.....	
13,200	66,000	.029050	.003300	.....	.....	
13,600	68,000	.032000	.002950	.....	.....	
14,000	70,000	.036250	.004250	.....	.....	
14,400	72,000	.042000	.005750	.....	.....	
14,800	74,000	.046250	.004250	.....	.....	
15,200	76,000	.053000	.006750	.....	.....	
15,600	78,000	.062250	.009250	.....	.....	
16,000	80,000	.0950	.032750	.....	.....	
16,760	83,800	.1550	.0600	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	83,800
Elastic limit per square inch of original section	do....	45,000
Elongation per inch after rupture	inch..	0.2650
Elongation per inch under strain at elastic limit	do....	.001500
Reduction in diameter at point of rupture	do....	.135
Reduction in area after rupture, per centum of original section		46.2
Position of rupture		".95 from neck
Character of broken surface		silky
Elongation of inch sections		".16, ".37*

No. 3606.

Marks, $\frac{32\ R_{41}\ T}{M\ T_2\ M}$
Diameter, ".505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	.....	
2,000	10,000	.000250	.000150	0.	.....	
3,000	15,000	.000400	.000150	0.	.....	
4,000	20,000	.000600	.000200	0.	.....	
5,000	25,000	.000750	.000150	0.	.....	
6,000	30,000	.000900	.000150	0.	.....	
7,000	35,000	.001050	.000150	0.	.....	
8,000	40,000	.001250	.000200	0.	.....	
9,000	45,000	.001450	.000200	.....	.....	Elastic limit.
9,200	46,000	.001700	.000250	.....	.....	
9,400	47,000	.004100	.002400	.....	.....	
9,600	48,000	.006400	.002300	.....	.....	
9,800	49,000	.007850	.001450	.....	.....	
10,000	50,000	.008750	.000900	.....	.....	
10,200	51,000	.009250	.000500	.....	.....	
10,400	52,000	.010500	.001250	.....	.....	
10,600	53,000	.011250	.000750	.....	.....	
10,800	54,000	.012000	.000750	.....	.....	
11,200	56,000	.014250	.002250	.....	.....	
11,600	58,000	.016400	.002150	.....	.....	
12,000	60,000	.018750	.002350	.....	.....	
12,400	62,000	.022000	.003250	.....	.....	
12,800	64,000	.025150	.003150	.....	.....	
13,200	66,000	.028400	.003250	.....	.....	
13,600	68,000	.031500	.003100	.....	.....	
14,000	70,000	.034900	.003400	.....	.....	
14,400	72,000	.038750	.003850	.....	.....	
14,800	74,000	.043100	.004350	.....	.....	
15,200	76,000	.049000	.005900	.....	.....	
15,600	78,000	.057500	.008500	.....	.....	
16,000	80,000	.066250	.008750	.....	.....	
16,400	82,000	.081500	.015350	.....	.....	
16,800	84,000	.1100	.0285	.....	.....	
17,020	85,100	.1500	.0400	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	85,100
Elastic limit per square inch of original section	do....	45,000
Elongation per inch after rupture	inch..	0.2300
Elongation per inch under strain at elastic limit	do....	.001450
Reduction in diameter at point of rupture	do....	.105
Reduction in area after rupture, per centum of original section		27.1
Position of rupture		".65 from neck
Character of broken surface		silky flaky, 60 per cent.; granular, 40 per cent.
Elongation of inch sections		".16, ".30*

No. 3416.

Marks, $\frac{32\ R_{ss}\ T}{M\ T_s\ M}$
Diameter, ".505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	.....	
2,000	10,000	.000250	.000150	0.	.....	
3,000	15,000	.000400	.000150	0.	.....	
4,000	20,000	.000600	.000200	0.	.....	
5,000	25,000	.000800	.000200	0.	.....	
6,000	30,000	.000950	.000150	0.	.....	
7,000	35,000	.001100	.000150	.....	.....	
8,000	40,000	.001300	.000200	.....	.....	
9,000	45,000	.001500	.000200	.....	.....	
9,600	48,000	.001600	.000100	.....	.....	
9,800	49,000	.001650	.000050	.....	.....	Elastic limit.
10,000	50,000	.001800	.000150	.....	.....	
10,200	51,000	.006500	.004700	.....	.....	
10,400	52,000	.007500	.001000	.....	.....	
10,600	53,000	.008400	.000900	.....	.....	
10,800	54,000	.009250	.000850	.....	.....	
11,000	55,000	.010350	.001100	.....	.....	
11,200	56,000	.011350	.001000	.....	.....	
11,400	57,000	.012400	.001050	.....	.....	
11,600	58,000	.013500	.001100	.....	.....	
11,800	59,000	.014500	.001000	.....	.....	
12,000	60,000	.015800	.001300	.....	.....	
12,400	62,000	.017800	.002000	.....	.....	
12,800	64,000	.020300	.002500	.....	.....	
13,200	66,000	.023400	.003100	.....	.....	
13,600	68,000	.026100	.002700	.....	.....	
14,000	70,000	.029500	.003400	.....	.....	
14,400	72,000	.033250	.003750	.....	.....	
14,800	74,000	.037500	.004250	.....	.....	
15,200	76,000	.042400	.004900	.....	.....	
15,600	78,000	.049000	.006600	.....	.....	
16,000	80,000	.057250	.008250	.....	.....	
16,400	82,000	.0650	.007750	.....	.....	
16,800	84,000	.0950	.0300	.....	.....	
16,990	84,950	.1250	.0300	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	84,950
Elastic limit per square inch of original section	do....	49,000
Elongation per inch after rupture	inch..	0.1950
Elongation per inch under strain at elastic limit	do....	.001650
Reduction in diameter at point of rupture	do....	.125
Reduction in area after rupture, per centum of original section		43.3
Position of rupture		".90 from neck
Character of broken surface		silky
Elongation of inch sections		".09, ".30*

No. 3417.

Marks, $\frac{32\ R_{32}\ T}{M\ T_8\ M}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	.....	
2,000	10,000	.000300	.000200	0.	.....	
3,000	15,000	.000450	.000150	0.	.....	
4,000	20,000	.000600	.000150	0.	.....	
5,000	25,000	.000800	.000200	0.	.....	
6,000	30,000	.000950	.000150	0.	.....	
7,000	35,000	.001150	.000200	0.	.....	
8,000	40,000	.001300	.000150	0.	.....	
9,000	45,000	.001500	.000200	.....	.....	
9,500	48,000	.001600	.000100	.....	.....	
9,800	49,000	.001700	.000100	.....	.....	Elastic limit.
10,000	50,000	.004750	.003050	.....	.....	
10,200	51,000	.007050	.002300	.....	.....	
10,400	52,000	.008100	.001050	.....	.....	
10,600	53,000	.009250	.001150	.....	.....	
10,800	54,000	.010050	.000800	.....	.....	
11,000	55,000	.011050	.001000	.....	.....	
11,200	56,000	.012100	.001050	.....	.....	
11,400	57,000	.013100	.001000	.....	.....	
11,600	58,000	.014150	.001050	.....	.....	
11,800	59,000	.015300	.001150	.....	.....	
12,000	60,000	.016500	.001200	.....	.....	
12,400	62,000	.018750	.002250	.....	.....	
12,800	64,000	.021500	.002750	.....	.....	
13,200	66,000	.024400	.002900	.....	.....	
13,600	68,000	.027500	.003100	.....	.....	
14,000	70,000	.031000	.003500	.....	.....	
14,400	72,000	.034850	.003850	.....	.....	
14,800	74,000	.038900	.004050	.....	.....	
15,200	76,000	.044100	.005200	.....	.....	
15,600	78,000	.051000	.006900	.....	.....	
16,000	80,000	.0550	.0040	.....	.....	
16,400	82,000	.0650	.0100	.....	.....	
16,800	84,000	.0900	.0250	.....	.....	
17,000	85,300	.1350	.0450	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	85,300
Elastic limit per square inch of original section	do....	49,000
Elongation per inch after rupture	inch..	0.2550
Elongation per inch under strain at elastic limit	do....	.001700
Reduction in diameter at point of rupture	do....	.125
Reduction in area after rupture, per centum of original section		43.3
Position of rupture		″.90 from neck
Character of broken surface		silky
Elongation of inch sections		″.16, ″.35*

No. 3621.

Marks, $\frac{32\ R_{43}\ T}{B\ T_3\ M}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000150	.000150	0.	.....	
2,000	10,000	.000350	.000200	0.	.....	
3,000	15,000	.000500	.000150	0.	.....	
4,000	20,000	.000700	.000200	0.	.....	
5,000	25,000	.000850	.000150	0.	.....	
6,000	30,000	.001050	.000200	0.	.....	
7,000	35,000	.001250	.000200	.....	.....	
8,000	40,000	.001400	.000150	.....	.....	
9,000	45,000	.001550	.000150	.....	.....	
9,200	46,000	.001650	.000100	.....	.....	
9,400	47,000	.001750	.000100	.....	.....	Elastic limit.
9,600	48,000	.001900	.000150	.....	.....	
9,800	49,000	.002250	.000350	.....	.....	
10,000	50,000	.003500	.001250	.....	.....	
10,200	51,000	.004750	.001250	.....	.....	
10,400	52,000	.006300	.001550	.....	.....	
10,600	53,000	.007500	.001200	.....	.....	
10,800	54,000	.008900	.001400	.....	.....	
11,200	56,000	.011050	.002150	.....	.....	
11,600	58,000	.012600	.001550	.....	.....	
12,000	60,000	.015200	.002600	.....	.....	
12,400	62,000	.017750	.002550	.....	.....	
12,800	64,000	.020200	.002450	.....	.....	
13,200	66,000	.022600	.002400	.....	.....	
13,600	68,000	.025000	.002400	.....	.....	
14,000	70,000	.027800	.002800	.....	.....	
14,400	72,000	.031550	.003750	.....	.....	
14,800	74,000	.035250	.003700	.....	.....	
15,200	76,000	.040000	.004750	.....	.....	
15,600	78,000	.045000	.005000	.....	.....	
16,000	80,000	.050750	.005750	.....	.....	
16,400	82,000	.060250	.009500	.....	.....	
16,800	84,000	.070000	.009750	.....	.....	
17,200	86,000	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	86,000
Elastic limit per square inch of original section	do....	47,000
Elongation per inch after rupture	inch..	0.0950
Elongation per inch under strain at elastic limit	do....	.001750
Reduction in diameter at point of rupture	do....	.035
Reduction in area after rupture, per centum of original section		13.2
Position of rupture		″.35 from neck
Character of broken surface	granular, radiating from a flaky spot at circumference	
Elongation of inch sections		″.08, ″.11*

No. 3622.

Marks, $\frac{32\ R_{33}\ T}{B\ T_1\ M}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000150	.000150	0.		
2,000	10,000	.000300	.000150	0.		
3,000	15,000	.000450	.000150	0.		
4,000	20,000	.000650	.000200	0.		
5,000	25,000	.000800	.000150	0.		
6,000	30,000	.000950	.000150	0.		
7,000	35,000	.001150	.000200	0.		
8,000	40,000	.001300	.000150	0.		
9,000	45,000	.001500	.000200			
9,200	46,000	.001600	.000100			Elastic limit.
9,400	47,000	.002500	.000900			
9,600	48,000	.004800	.001300			
9,800	49,000	.006450	.001650			
10,000	50,000	.007500	.001050			
10,200	51,000	.008600	.001100			
10,400	52,000	.009500	.000900			
10,600	53,000	.010500	.001000			
10,800	54,000	.011500	.001000			
11,200	56,000	.014000	.002500			
11,600	58,000	.016000	.002000			
12,000	60,000	.018350	.002350			
12,400	62,000	.020950	.002600			
12,800	64,000	.024250	.003300			
13,200	66,000	.027000	.002750			
13,600	68,000	.031000	.004000			
14,000	70,000	.034700	.003700			
14,400	72,000	.038750	.004050			
14,800	74,000	.043500	.004750			
15,200	76,000	.048650	.005150			
15,600	78,000	.056750	.008100			
16,000	80,000	.0660	.009250			
16,400	82,000	.0850	.0190			
16,800	84,000	.1100	.0250			
16,920	84,600					Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds	84,600
Elastic limit per square inch of original section	do	46,000
Elongation per inch after rupture	inch	0.1400
Elongation per inch under strain at elastic limit	do	.001600
Reduction in diameter at point of rupture	do	.025
Reduction in area after rupture, per centum of original section		9.5
Position of rupture		″.35 from neck
Character of broken surface	granular, radiating from a flaky spot at the circumference	
Elongation of inch sections		″.15*, ″.13

No. 3623.

Marks, $\frac{32\ R_2\ T}{M\ T_2\ M}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000150	.000150	.....	.....	
2,000	10,000	.000300	.000300	.....	.....	
3,000	15,000	.000450	.000150	.....	.....	
4,000	20,000	.000650	.000200	.....	.....	
5,000	25,000	.000800	.000150	.....	.....	
6,000	30,000	.000950	.000150	.....	.....	
7,000	35,000	.001100	.000150	.....	.....	
8,000	40,000	.001300	.000200	.....	.....	
8,600	43,000	.001400	.000100	.....	.....	
8,800	44,000	.001500	.000100	.....	.....	Elastic limit.
9,000	45,000	.003500	.002000	.....	.....	
9,200	46,000	.004050	.000550	.....	.....	
9,400	47,000	.005250	.001200	.....	.....	
9,600	48,000	.006300	.001050	.....	.....	
9,800	49,000	.007250	.000950	.....	.....	
10,000	50,000	.008000	.000750	.....	.....	
10,400	52,000	.010250	.002250	.....	.....	
10,800	54,000	.011750	.001500	.....	.....	
11,200	56,000	.014500	.002750	.....	.....	
11,600	58,000	.016500	.002000	.....	.....	
12,000	60,000	.018750	.002250	.....	.....	
12,400	62,000	.021750	.003000	.....	.....	
12,800	64,000	.024500	.002750	.....	.....	
13,200	66,000	.027850	.003350	.....	.....	
13,600	68,000	.031000	.003150	.....	.....	
14,000	70,000	.034500	.003500	.....	.....	
14,400	72,000	.038250	.003750	.....	.....	
14,800	74,000	.043250	.005000	.....	.....	
15,200	76,000	.049500	.006250	.....	.....	
15,600	78,000	.055750	.006250	.....	.....	
16,000	80,000	.0650	.009250	.....	.....	
16,400	82,000	.0850	.0200	.....	.....	
16,790	83,950	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	83,950
Elastic limit per square inch of original section	do....	44,000
Elongation per inch after rupture	inch..	0.1950
Elongation per inch under strain at elastic limit	do....	.001500
Reduction in diameter at point of rupture	do....	.085
Reduction in area after rupture, per centum of original section		30.7
Position of rupture		″.80 from neck
Character of broken surface	silky flaky.	Opened first on one side
Elongation of inch sections		″.13, ″.26*

No. 3624.

Marks, $\frac{32\ R_{43}\ T}{M\ T_4\ M}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000150	.000150	0.	.....	
2,000	10,000	.000350	.000200	0.	.....	
3,000	15,000	.000500	.000150	0.	.....	
4,000	20,000	.000700	.000200	0.	.....	
5,000	25,000	.000850	.000150	0.	.....	
6,000	30,000	.001000	.000150	0.	.....	
7,000	35,000	.001200	.000200	0.	.....	
8,000	40,000	.001400	.000200	.000050	.000050	
8,400	42,000	.001450	.000050	.....	.....	
8,600	43,000	.001500	.000050	.....	.....	
8,800	44,000	.001550	.000050	.....	.....	Elastic limit
9,000	45,000	.002400	.000850	.....	.....	
9,200	46,000	.003100	.000700	.....	.....	
9,400	47,000	.004000	.000900	.....	.....	
9,600	48,000	.005850	.001850	.....	.....	
9,800	49,000	.006900	.001050	.....	.....	
10,000	50,000	.008000	.001100	.....	.....	
10,400	52,000	.009850	.001850	.....	.....	
10,800	54,000	.011850	.002000	.....	.....	
11,200	56,000	.014000	.002150	.....	.....	
11,600	58,000	.016100	.002100	.....	.....	
12,000	60,000	.018500	.002400	.....	.....	
12,400	62,000	.020650	.002150	.....	.....	
12,800	64,000	.023250	.002600	.....	.....	
13,200	66,000	.026500	.003250	.....	.....	
13,600	68,000	.029200	.002700	.....	.....	
14,000	70,000	.032550	.003350	.....	.....	
14,400	72,000	.037100	.004550	.....	.....	
14,800	74,000	.042350	.005250	.....	.....	
15,200	76,000	.048250	.005900	.....	.....	
15,600	78,000	.054000	.005750	.....	.....	
16,000	80,000	.063250	.009250	.....	.....	
16,400	82,000	.0800	.016750	.....	.....	
16,770	83,850	.1050	.0250	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	83,850
Elastic limit per square inch of original section	do....	44,000
Elongation per inch after rupture	inch..	0.1650
Elongation per inch under strain at elastic limit	do....	.001550
Reduction in diameter at point of rupture	do....	.105
Reduction in area after rupture, per centum of original section		37.1
Position of rupture		″.60 from neck
Character of broken surface	silky serrated.	Opened first on one side
Elongation of inch sections		″.07, ″.26

No. 3669.

Marks, $\frac{32\ R_{45}\ T}{B\ T_S\ M}$
Diameter, ″.504.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	.....	
2,000	10,000	.000250	.000150	0.	.....	
3,000	15,000	.000350	.000100	0.	.....	
4,000	20,000	.000500	.000150	0.	.....	
5,000	25,000	.000700	.000200	0.	.....	
6,000	30,000	.000900	.000200	0.	.....	
7,000	35,000	.001050	.000150	0.	.....	
8,000	40,000	.001350	.000300	.000050	.000050	
8,200	41,000	.001400	.000050	.....	.....	
8,400	42,000	.001400	0.	.....	.....	
8,600	43,000	.001450	.000050	.....	.....	
8,800	44,000	.001550	.000100	.....	.....	Elastic limit.
9,000	45,000	.002550	.001000	.....	.....	
9,200	46,000	.005150	.002600	.....	.....	
9,400	47,000	.006000	.000850	.....	.....	
9,600	48,000	.007100	.001100	.....	.....	
9,800	49,000	.008050	.000950	.....	.....	
10,000	50,000	.009100	.001050	.....	.....	
10,400	52,000	.011350	.002250	.....	.....	
10,800	54,000	.013500	.002150	.....	.....	
11,200	56,000	.015600	.002100	.....	.....	
11,600	58,000	.018100	.002500	.....	.....	
12,000	60,000	.020650	.002550	.....	.....	
12,400	62,000	.023500	.002850	.....	.....	
12,800	64,000	.026750	.003250	.....	.....	
13,200	66,000	.030000	.003250	.....	.....	
13,600	68,000	.034000	.004000	.....	.....	
14,000	70,000	.037750	.003750	.....	.....	
14,400	72,000	.043500	.005750	.....	.....	
14,800	74,000	.048750	.005250	.....	.....	
15,200	76,000	.055000	.006250	.....	.....	
15,600	78,000	.066000	.011000	.....	.....	
16,000	80,000	.079750	.013750	.....	.....	
16,400	82,000	.1050	.025250	.....	.....	
16,590	82,950	.1500	.0450	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	82,950
Elastic limit per square inch of original section	do....	44,000
Elongation per inch after rupture	inch..	0.2000
Elongation per inch under strain at elastic limit	do....	.001550
Reduction in diameter at point of rupture	do....	.074
Reduction in area after rupture, per centum of original section		27.4
Position of rupture		″.80 from neck
Character of broken surface	silky serrated, 25 per cent.; granular, 75 per cent.	
Elongation of inch sections		″.24*, ″.16

No. 3670.

Marks, $\frac{32\ R_{43}\ T}{B\ T_6\ M}$
Diameter, ″.504.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	.....	
2,000	10,000	.000300	.000200	0.	.....	
3,000	15,000	.000450	.000150	0.	.....	
4,000	20,000	.000600	.000150	0.	.....	
5,000	25,000	.000800	.000200	0.	.....	
6,000	30,000	.001000	.000200	0.	.....	
7,000	35,000	.001150	.000150	0.	.....	
8,000	40,000	.001350	.000200	0.	.....	
8,200	41,000	.001400	.000050	.....	.....	
8,400	42,000	.001450	.000050	.....	.....	
8,600	43,000	.001500	.000050	.....	.....	Elastic limit.
8,800	44,000	.001950	.000450	.....	.....	
9,000	45,000	.004800	.002850	.....	.....	
9,200	46,000	.006000	.001200	.....	.....	
9,400	47,000	.007250	.001250	.....	.....	
9,600	48,000	.008250	.001000	.....	.....	
9,800	49,000	.009000	.000750	.....	.....	
10,000	50,000	.009750	.000750	.....	.....	
10,400	52,000	.012250	.002500	.....	.....	
10,800	54,000	.014000	.001750	.....	.....	
11,200	56,000	.016250	.002250	.....	.....	
11,600	58,000	.019000	.002750	.....	.....	
12,000	60,000	.021500	.002500	.....	.....	
12,400	62,000	.024500	.003000	.....	.....	
12,800	64,000	.027250	.002750	.....	.....	
13,200	66,000	.030500	.003250	.....	.....	
13,600	68,000	.035000	.004500	.....	.....	
14,000	70,000	.039500	.004500	.....	.....	
14,400	72,000	.044000	.004500	.....	.....	
14,800	74,000	.050750	.006750	.....	.....	
15,200	76,000	.057000	.006250	.....	.....	
15,600	78,000	.069000	.012000	.....	.....	
16,000	80,000	.0850	.0160	.....	.....	
16,390	81,950	.1400	.0550	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	81,950
Elastic limit per square inch of original section	do....	43,000
Elongation per inch after rupture	inch..	0.1800
Elongation per inch under strain at elastic limit	do....	.001500
Reduction in diameter at point of rupture	do....	.064
Reduction in area after rupture, per centum of original section		23.9
Position of rupture		″.85 from neck
Character of broken surface		silky serrated, 15 per cent.; granular, 85 per cent.
Elongation of inch sections		″.13, ″.23*

No. 3671.

Marks, $\frac{32\ R_4\ T}{M\ T_2\ M}$
Diameter, ".505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	.....	
2,000	10,000	.000300	.000200	0.	.....	
3,000	15,000	.000500	.000200	0.	.....	
4,000	20,000	.000650	.000150	0.	.....	
5,000	25,000	.000800	.000150	0.	.....	
6,000	30,000	.001000	.000200	0.	.....	
7,000	35,000	.001150	.000150	0.	.....	
8,000	40,000	.001350	.000200	0.	.....	
9,000	45,000	.001550	.000200	.....	.....	Elastic limit.
9,200	46,000	.002000	.000450	.....	.....	
9,400	47,000	.004400	.002400	.....	.....	
9,600	48,000	.005250	.000850	.....	.....	
9,800	49,000	.006400	.001150	.....	.....	
10,000	50,000	.007600	.001200	.....	.....	
10,400	52,000	.009750	.002150	.....	.....	
10,800	54,000	.011550	.001800	.....	.....	
11,200	56,000	.013750	.002200	.....	.....	
11,600	58,000	.016000	.002250	.....	.....	
12,000	60,000	.018250	.002250	.....	.....	
12,400	62,000	.020750	.002500	.....	.....	
12,800	64,000	.023800	.003050	.....	.....	
13,200	66,000	.026250	.002450	.....	.....	
13,600	68,000	.029400	.003150	.....	.....	
14,000	70,000	.033500	.004100	.....	.....	
14,400	72,000	.037350	.003850	.....	.....	
14,800	74,000	.042000	.004650	.....	.....	
15,200	76,000	.048250	.006250	.....	.....	
15,600	78,000	.055050	.006800	.....	.....	
16,000	80,000	.0650	.009950	.....	.....	
16,400	82,000	.0800	.0150	.....	.....	
16,800	84,000	.1100	.0300	.....	.....	
16,820	84,100	.1500	.0400	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	84,100
Elastic limit per square inch of original section	do....	45,000
Elongation per inch after rupture	inch..	0.2050
Elongation per inch under strain at elastic limit	do....	.001550
Reduction in diameter at point of rupture	do....	.115
Reduction in area after rupture, per centum of original section		40.8
Position of rupture		".65 from neck
Character of broken surface		silky serrated; trace of granulation
Elongation of inch sections		".12, ".29+

No. 3672.

Marks, $\frac{32\ R_{ss}\ T}{M\ T_s\ M}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000150	.000150	0.	.....	
2,000	10,000	.000300	.000150	0.	.....	
3,000	15,000	.000500	.000200	0.	.....	
4,000	20,000	.000650	.000150	0.	.....	
5,000	25,000	.000800	.000150	0.	.....	
6,000	30,000	.000950	.000150	0.	.....	
7,000	35,000	.001150	.000200	0.	.....	
8,000	40,000	.001300	.000150	0.	.....	
8,600	43,000	.001450	.000150	.....	.....	
8,800	44,000	.001500	.000050	.....	.....	Elastic limit.
9,000	45,000	.001750	.000250	.....	.....	
9,200	46,000	.003500	.001750	.....	.....	
9,400	47,000	.005500	.002000	.....	.....	
9,600	48,000	.006800	.001300	.....	.....	
9,800	49,000	.007750	.000950	.....	.....	
10,000	50,000	.008750	.001000	.....	.....	
10,400	52,000	.010900	.002150	.....	.....	
10,800	54,000	.013150	.002250	.....	.....	
11,200	56,000	.015250	.002100	.....	.....	
11,600	58,000	.017750	.002500	.....	.....	
12,000	60,000	.020500	.002750	.....	.....	
12,400	62,000	.022900	.002400	.....	.....	
12,800	64,000	.026000	.003100	.....	.....	
13,200	66,000	.029250	.003250	.....	.....	
13,600	68,000	.032850	.003600	.....	.....	
14,000	70,000	.037000	.004150	.....	.....	
14,400	72,000	.042000	.005000	.....	.....	
14,800	74,000	.047500	.005500	.....	.....	
15,200	76,000	.054500	.007000	.....	.....	
15,600	78,000	.064250	.009750	.....	.....	
16,000	80,000	.0785	.014250	.....	.....	
16,400	82,000	.1050	.0265	.....	.....	
16,560	82,800	.1400	.0350	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section.....pounds.. 82,800
Elastic limit per square inch of original section.....do.... 44,000
Elongation per inch after rupture.....inch.. 0.2000
Elongation per inch under strain at elastic limit.....do.... .001500
Reduction in diameter at point of rupture.....do.... .065
Reduction in area after rupture, per centum of original section..... 28.9
Position of rupture.....1″ from neck
Character of broken surface, granular; silky serrated spot at the circumference. Opened cracks in surface of stem.
Elongation of inch sections.....″.21*, ″.19

No. 3683.

Marks, $\frac{32\ R_{48}\ T}{B\ T_7\ M}$
Diameter, ".505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000200	.000200	0.	.....	
2,000	10,000	.000400	.000200	0.	.....	
3,000	15,000	.000550	.000150	0.	.....	
4,000	20,000	.000750	.000200	0.	.....	
5,000	25,000	.000900	.000150	0.	.....	
6,000	30,000	.001100	.000200	.000050	.000050	
7,000	35,000	.001250	.000150	.....	.....	
8,000	40,000	.001400	.000150	.....	.....	
9,000	45,000	.001500	.000100	.....	.....	
9,400	47,000	.001650	.000150	.....	.....	
9,600	48,000	.001650	0.	.....	.....	
9,800	49,000	.001750	.000100	.....	.....	Elastic limit.
10,000	50,000	.002250	.000500	.....	.....	
10,200	51,000	.004250	.002000	.....	.....	
10,400	52,000	.005000	.000750	.....	.....	
10,600	53,000	.006700	.001700	.....	.....	
10,800	54,000	.007500	.000800	.....	.....	
11,000	55,000	.008250	.000750	.....	.....	
11,200	56,000	.009100	.000850	.....	.....	
11,600	58,000	.011400	.002300	.....	.....	
12,000	60,000	.013500	.002100	.....	.....	
12,400	62,000	.015600	.002100	.....	.....	
12,800	64,000	.017500	.001900	.....	.....	
13,200	66,000	.020000	.002500	.....	.....	
13,600	68,000	.022100	.002100	.....	.....	
14,000	70,000	.024750	.002650	.....	.....	
14,400	72,000	.028000	.003250	.....	.....	
14,800	74,000	.031500	.003500	.....	.....	
15,200	76,000	.034750	.003250	.....	.....	
15,600	78,000	.038250	.003500	.....	.....	
16,000	80,000	.042900	.004650	.....	.....	
16,400	82,000	.048500	.005600	.....	.....	
16,800	84,000	.055600	.007100	.....	.....	
17,200	86,000	.064750	.009150	.....	.....	
17,600	88,000	.0800	.015250	.....	.....	
18,000	90,000	.1000	.0200	.....	.....	
18,070	90,350	.1200	.0300	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	90,350
Elastic limit per square inch of original section	do ...	49,000
Elongation per inch after rupture	inch..	0.2050
Elongation per inch under strain at elastic limit	do....	.001750
Reduction in diameter at point of rupture	do....	.105
Reduction in area after rupture, per centum of original section		37.1
Position of rupture		1" from neck
Character of broken surface		silky flaky, 85 per cent.; granular, 15 per cent.
Elongation of inch sections		".28*, ".13

No. 3684.

Marks, $\frac{32\ R_{13}\ T}{B\ T_5\ M}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000150	.000150	0.	.....	
2,000	10,000	.000350	.000200	0.	.....	
3,000	15,000	.000550	.000200	0.	.....	
4,000	20,000	.000750	.000200	0.	.....	
5,000	25,000	.000900	.000150	0.	.....	
6,000	30,000	.001050	.000150	0.	.....	
7,000	35,000	.001200	.000150	0.	.....	
8,000	40,000	.001300	.000100	0.	.....	
9,000	45,000	.001450	.000150	.....	.....	
9,600	48,000	.001650	.000200	.....	.....	
9,800	49,000	.001750	.000100	.....	.....	
10,000	50,000	.001900	.000150	.....	.....	
10,200	51,000	.001950	.000050	.....	.....	
10,400	52,000	.002000	.000050	.....	.....	Elastic limit.
10,600	53,000	.002200	.000200	.....	.....	
10,800	54,000	.002750	.000550	.....	.....	
11,000	55,000	.003400	.000650	.....	.....	
11,200	56,000	.005100	.001700	.....	.....	
11,600	58,000	.007100	.002000	.....	.....	
12,000	60,000	.009500	.002400	.....	.....	
12,400	62,000	.011850	.002350	.....	.....	
12,800	64,000	.014050	.002200	.....	.....	
13,200	66,000	.016050	.002000	.....	.....	
13,600	68,000	.018400	.002350	.....	.....	
14,000	70,000	.020550	.002150	.....	.....	
14,400	72,000	.023250	.002700	.....	.....	
14,800	74,000	.026500	.003250	.....	.....	
15,200	76,000	.029000	.002500	.....	.....	
15,600	78,000	.032250	.003250	.....	.....	
16,000	80,000	.036100	.003850	.....	.....	
16,400	82,000	.040400	.004300	.....	.....	
16,800	84,000	.046000	.005600	.....	.....	
17,300	86,000	.051900	.005900	.....	.....	
17,600	88,000	.061250	.009350	.....	.....	
18,000	90,000	.0740	.012750	.....	.....	
18,400	92,000	.0950	.0210	.....	.....	
18,430	92,150	.1300	.0350	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	92,150
Elastic limit per square inch of original section	do....	52,000
Elongation per inch after rupture	inch..	0.1900
Elongation per inch under strain at elastic limit	do....	.002600
Reduction in diameter at point of rupture	do....	.085
Reduction in area after rupture, per centum of original section		30.7
Position of rupture		1″ from neck
Character of broken surface		granular; flaky spot at the circumference
Elongation of inch sections		″.15, ″.23

No. 3685.

Marks, $\frac{32\ R_{28}\ T}{M\ T_7\ M}$
Diameter, ".505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000150	.000150	0.	.....	
2,000	10,000	.000350	.000200	0.	.....	
3,000	15,000	.000550	.000200	0.	.....	
4,000	20,000	.000700	.000150	0.	.....	
5,000	25,000	.000850	.000150	0.	.....	
6,000	30,000	.001050	.000200	0.	.....	
7,000	35,000	.001250	.000200	0.	.....	
8,000	40,000	.001400	.000150	.000050	.000050	
9,000	45,000	.001550	.000150	.....	.....	
9,600	48,000	.001600	.000050	.....	.....	
9,800	49,000	.001650	.000050	.....	.....	
10,000	50,000	.001750	.000100	.....	.....	Elastic limit.
10,200	51,000	.001900	.000150	.....	.....	
10,400	52,000	.002350	.000450	.....	.....	
10,600	53,000	.003400	.001050	.....	.....	
10,800	54,000	.005350	.001950	.....	.....	
11,200	56,000	.007400	.002050	.....	.....	
11,600	58,000	.009400	.002000	.....	.....	
12,000	60,000	.011400	.002000	.....	.....	
12,400	62,000	.013400	.002000	.....	.....	
12,800	64,000	.015650	.002250	.....	.....	
13,200	66,000	.017900	.002250	.....	.....	
13,600	68,000	.020350	.002450	.....	.....	
14,000	70,000	.022600	.002250	.....	.....	
14,400	72,000	.025550	.002950	.....	.....	
14,800	74,000	.028500	.002950	.....	.....	
15,200	76,000	.031550	.003050	.....	.....	
15,600	78,000	.035350	.003800	.....	.....	
16,000	80,000	.039900	.004550	.....	.....	
16,400	82,000	.044750	.004850	.....	.....	
16,800	84,000	.051400	.006650	.....	.....	
17,200	86,000	.059250	.007850	.....	.....	
17,600	88,000	.0700	.010750	.....	.....	
18,000	90,000	.0850	.0150	.....	.....	
18,160	90,800	.1200	.0350	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	90,800
Elastic limit per square inch of original section	do....	50,000
Elongation per inch after rupture	inch..	0.1750
Elongation per inch under strain at elastic limit	do....	.001750
Reduction in diameter at point of rupture	do....	.075
Reduction in area after rupture, per centum of original section		27.4
Position of rupture		".80 from neck
Character of broken surface		silky flaky, 40 per cent.; granular, 60 per cent.
Elongation of inch sections		".11, ".24*

No. 3686.

Marks, $\frac{32\ R_{13}\ T}{M\ T_8\ M}$
Diameter, ".505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	.....	
2,000	10,000	.000300	.000200	0.	.....	
3,000	15,000	.000500	.000200	0.	.....	
4,000	20,000	.000650	.000150	0.	.....	
5,000	25,000	.000800	.000150	0.	.....	
6,000	30,000	.001000	.000200	0.	.....	
7,000	35,000	.001200	.000200	0.	.....	
8,000	40,000	.001350	.000150	0.	.....	
9,000	45,000	.001500	.000150	.....	.....	
9,600	48,000	.001600	.000100	.....	.....	
9,800	49,000	.001700	.000100	.....	.....	
10,000	50,000	.001800	.000100	.....	.....	
10,200	51,000	.001950	.000150	.....	.....	
10,400	52,000	.002000	.000050	.....	.....	Elastic limit.
10,600	53,000	.003750	.001750	.....	.....	
10,800	54,000	.005150	.001400	.....	.....	
11,000	55,000	.006000	.000850	.....	.....	
11,200	56,000	.006750	.000750	.....	.....	
11,600	58,000	.008100	.001350	.....	.....	
12,000	60,000	.010500	.002400	.....	.....	
12,400	62,000	.013000	.002500	.....	.....	
12,800	64,000	.015000	.002000	.....	.....	
13,200	66,000	.017500	.002500	.....	.....	
13,600	68,000	.019500	.002000	.....	.....	
14,000	70,000	.021500	.002000	.....	.....	
14,400	72,000	.023400	.002900	.....	.....	
14,800	74,000	.025850	.002450	.....	.....	
15,200	76,000	.028500	.002650	.....	.....	
15,600	78,000	.031750	.003250	.....	.....	
16,000	80,000	.035250	.003500	.....	.....	
16,400	82,000	.040000	.004750	.....	.....	
16,800	84,000	.044250	.004250	.....	.....	
17,200	86,000	.049750	.005500	.....	.....	
17,600	88,000	.057250	.007500	.....	.....	
18,000	90,000	.0670	.009750	.....	.....	
18,400	92,000	.0800	.0130	.....	.....	
18,770	93,850	.1300	.0500	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	93,850
Elastic limit per square inch of original section	do....	52,000
Elongation per inch after rupture	inch..	0.1800
Elongation per inch under strain at elastic limit	do....	.002000
Reduction in diameter at point of rupture	do....	.065
Reduction in area after rupture, per centum of original section		23.9
Position of rupture		".75 from neck
Character of broken surface	silky flaky, 45 per cent.; granular, 55 per cent.	
Elongation of inch sections		".24*, ".12

No. 3494.

Marks, $\frac{32\ R_{ss}\ T}{B\ T_1\ M}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	.....	
2,000	10,000	.000250	.000150	0.	.....	
3,000	15,000	.000400	.000150	0.	.....	
4,000	20,000	.000600	.000200	0.	.....	
5,000	25,000	.000750	.000150	0.	.....	
6,000	30,000	.000950	.000200	0.	.....	
7,000	35,000	.001100	.000150	0.	.....	
8,000	40,000	.001250	.000150	0.	.....	
9,000	45,000	.001400	.000150	.....	.....	
9,200	46,000	.001450	.000050	.....	.....	
9,400	47,000	.001500	.000050	.....	.....	Elastic limit.
9,600	48,000	.002400	.000900	.....	.....	
9,800	49,000	.003500	.001100	.....	.....	
10,000	50,000	.007000	.003500	.....	.....	
10,200	51,000	.007900	.000900	.....	.....	
10,400	52,000	.008900	.001000	.....	.....	
10,600	53,000	.009900	.001000	.....	.....	
10,800	54,000	.010850	.000950	.....	.....	
11,000	55,000	.011850	.001000	.....	.....	
11,200	56,000	.013500	.001650	.....	.....	
11,400	57,000	.014500	.001000	.....	.....	
11,600	58,000	.015500	.001000	.....	.....	
11,800	59,000	.016400	.000900	.....	.....	
12,000	60,000	.017550	.001150	.....	.....	
12,400	62,000	.019550	.002000	.....	.....	
12,800	64,000	.022400	.002850	.....	.....	
13,200	66,000	.025500	.003100	.....	.....	
13,600	68,000	.028900	.003400	.....	.....	
14,000	70,000	.032000	.003100	.....	.....	
14,400	72,000	.036250	.004250	.....	.....	
14,800	74,000	.041400	.005150	.....	.....	
15,200	76,000	.047000	.005600	.....	.....	
15,600	78,000	.053500	.006500	.....	.....	
16,000	80,000	.062600	.009100	.....	.....	
16,400	82,000	.0800	.0174	.....	.....	
16,800	84,000	.1000	.0200	.....	.....	
17,000	85,000	.1550	.0550	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	85,000
Elastic limit per square inch of original section	do ...	47,000
Elongation per inch after rupture	inch..	0.2050
Elongation per inch under strain at elastic limit	do	.001500
Reduction in diameter at point of rupture	do ...	.075
Reduction in area after rupture, per centum of original section	.....	27.4
Position of rupture	.....	″.60 from neck
Character of broken surface	granular, 60 per cent.; silky serrated, 40 per cent.	
Elongation of inch sections	.....	″.25*, ″.16

No. 3495.

Marks, $\frac{32\ R_{ss}\ T}{B\ T_2\ M}$
Diameter, ".505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	.....	
2,000	10,000	.000250	.000150	0.	.....	
3,000	15,000	.000450	.000200	0.	.....	
4,000	20,000	.000600	.000150	0.	.....	
5,000	25,000	.000800	.000200	0.	.....	
6,000	30,000	.001000	.000200	0.	.....	
7,000	35,000	.001200	.000200	0.	.....	
8,000	40,000	.001350	.000150	0.	.....	
9,000	45,000	.001550	.000200	.....	.....	Elastic limit.
9,200	46,000	.001700	.000150	.....	.....	
9,400	47,000	.003250	.001550	.....	.....	
9,600	48,000	.007000	.003750	.....	.....	
9,800	49,000	.007850	.000850	.....	.....	
10,000	50,000	.009000	.001150	.....	.....	
10,200	51,000	.009900	.000900	.....	.....	
10,400	52,000	.010700	.000800	.....	.....	
10,600	53,000	.011650	.000950	.....	.....	
10,800	54,000	.012750	.001100	.....	.....	
11,000	55,000	.013850	.001100	.....	.....	
11,200	56,000	.014850	.001000	.....	.....	
11,400	57,000	.016000	.001150	.....	.....	
11,600	58,000	.017100	.001100	.....	.....	
11,800	59,000	.018500	.001400	.....	.....	
12,000	60,000	.020000	.001500	.....	.....	
12,400	62,000	.022300	.002300	.....	.....	
12,800	64,000	.025250	.002950	.....	.....	
13,200	66,000	.028500	.003250	.....	.....	
13,600	68,000	.032050	.003550	.....	.....	
14,000	70,000	.036400	.004350	.....	.....	
14,400	72,000	.041000	.004600	.....	.....	
14,800	74,000	.046500	.005500	.....	.....	
15,200	76,000	.052250	.005750	.....	.....	
15,600	78,000	.061000	.008750	.....	.....	
16,000	80,000	.0750	.0140	.....	.....	
16,400	82,000	.0900	.0150	.....	.....	
16,780	83,900	.1500	.0600	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	83,900
Elastic limit per square inch of original section	do....	45,000
Elongation per inch after rupture	inch...	0.2400
Elongation per inch under strain at elastic limit	do....	.001550
Reduction in diameter at point of rupture	do....	.115
Reduction in area after rupture, per centum of original section		40.3
Position of rupture		".68 from neck
Character of broken surface		silky
Elongation of inch sections		".14, ".34

No. 3496.

Marks, $\frac{32\ R_4\ T}{M\ T_1\ M}$
Diameter, .505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000150	.000150	0.	.....	
2,000	10,000	.000300	.000150	0.	.....	
3,000	15,000	.000450	.000150	0.	.....	
4,000	20,000	.000650	.000200	0.	.....	
5,000	25,000	.000850	.000200	0.	.....	
6,000	30,000	.001000	.000150	0.	.....	
7,000	35,000	.001200	.000200	0.	.....	
8,000	40,000	.001350	.000150	0.	.....	
9,000	45,000	.001500	.000150	.....	.....	
9,200	46,000	.001550	.000050	.....	.....	
9,400	47,000	.001600	.000050	.....	.....	
9,600	48,000	.001700	.000100	.....	.....	Elastic limit.
9,800	49,000	.002500	.000800	.....	.....	
10,000	50,000	.004500	.002000	.....	.....	
10,200	51,000	.005600	.001100	.....	.....	
10,400	52,000	.006550	.000950	.....	.....	
10,600	53,000	.007400	.000850	.....	.....	
10,800	54,000	.008350	.000950	.....	.....	
11,000	55,000	.009100	.000750	.....	.....	
11,200	56,000	.010250	.001150	.....	.....	
11,400	57,000	.011050	.000800	.....	.....	
11,600	58,000	.012000	.000950	.....	.....	
11,800	59,000	.013000	.001000	.....	.....	
12,000	60,000	.013900	.000900	.....	.....	
12,400	62,000	.016500	.00 .600	.....	.....	
12,800	64,000	.019000	.002500	.....	.....	
13,200	66,000	.021250	.002250	.....	.....	
13,600	68,000	.023250	.002000	.....	.....	
14,000	70,000	.025750	.002500	.....	.....	
14,400	72,000	.028500	.002750	.....	.....	
14,800	74,000	.032000	.003500	.....	.....	
15,200	76,000	.035000	.003000	.....	.....	
15,600	78,000	.039250	.004250	.....	.....	
16,000	80,000	.043750	.004500	.....	.....	
16,400	82,000	.050000	.006250	.....	.....	
16,800	84,000	.057500	.007500	.....	.....	
17,200	86,000	.0650	.0075	.....	.....	
17,600	88,000	.0850	.0200	.....	.....	
18,000	90,000	.1150	.0300	.....	.....	
18,040	90,200	.1300	.0150	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	90,200
Elastic limit per square inch of original section	do....	48,000
Elongation per inch after rupture	inch..	0.2000
Elongation per inch under strain at elastic limit	do....	.001700
Reduction in diameter at point of rupture	do....	.105
Reduction in area after rupture, per centum of original section		37.1
Position of rupture		".90 from neck
Character of broken surface		silky
Elongation of inch sections		".27*, ".18

No. 3497.

Marks, $\frac{32\ R_{46}\ T}{M\ T,\ M}$
Diameter, ".505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	.....	
2,000	10,000	.000250	.000150	0.	.....	
3,000	15,000	.000450	.000200	0.	.....	
4,000	20,000	.000600	.000150	0.	.....	
5,000	25,000	.000800	.000200	0.	.....	
6,000	30,000	.000950	.000150	0.	.....	
7,000	35,000	.001150	.000200	0.	.....	
8,000	40,000	.001350	.000200	0.	.....	
9,000	45,000	.001500	.000150	.....	.....	
9,200	46,000	.001550	.000050	.....	.....	
9,400	47,000	.001600	.000050	.....	.....	Elastic limit.
9,600	48,000	.002500	.000900	.....	.....	
9,800	49,000	.005100	.002600	.....	.....	
10,000	50,000	.006000	.000900	.....	.....	
10,200	51,000	.006950	.000950	.....	.....	
10,400	52,000	.007600	.000650	.....	.....	
10,600	53,000	.008350	.000750	.....	.....	
10,800	54,000	.009150	.000800	.....	.....	
11,000	55,000	.010150	.001000	.....	.....	
11,200	56,000	.011250	.001100	.....	.....	
11,400	57,000	.012250	.001000	.....	.....	
11,600	58,000	.013000	.000750	.....	.....	
11,800	59,000	.014250	.001250	.....	.....	
12,000	60,000	.015250	.001000	.....	.....	
12,400	62,000	.017350	.002100	.....	.....	
12,800	64,000	.019500	.002150	.....	.....	
13,200	66,000	.022100	.002600	.....	.....	
13,600	68,000	.024550	.002450	.....	.....	
14,000	70,000	.027350	.002800	.....	.....	
14,400	72,000	.030550	.003200	.....	.....	
14,800	74,000	.034000	.003450	.....	.....	
15,200	76,000	.037900	.003900	.....	.....	
15,600	78,000	.042350	.004450	.....	.....	
16,000	80,000	.048250	.005900	.....	.....	
16,400	82,000	.054500	.006250	.....	.....	
16,800	84,000	.0625	.0080	.....	.....	
17,200	86,000	.0800	.0175	.....	.....	
17,600	88,000	.1050	.0250	.....	.....	
17,680	88,400	.1400	.0350	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	88,400
Elastic limit per square inch of original section	do....	47,000
Elongation per inch after rupture	inch..	0.2200
Elongation per inch under strain at elastic limit	do....	.001600
Reduction in diameter at point of rupture	do....	.115
Reduction in area after rupture, per centum of original section		40.3
Position of rupture		at middle of stem
Character of broken surface		silky
Elongation of inch sections		".25*, ".19

No. 3538.

Marks, $\frac{32\ R_{ss}\ T}{B\ T.M}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.		
2,000	10,000	.000300	.000200	0.		
3,000	15,000	.000500	.000200	0.		
4,000	20,000	.000650	.000150	0.		
5,000	25,000	.000800	.000150	0.		
6,000	30,000	.001000	.000200	0.		
7,000	35,000	.001200	.000200	0.		
8,000	40,000	.001350	.000150	0.		
9,000	45,000	.001500	.000150			
9,600	48,000	.001650	.000150			Elastic limit.
9,800	49,000	.003350	.001700			
10,000	50,000	.008000	.004650			
10,200	51,000	.008750	.000750			
10,400	52,000	.009250	.000500			
10,600	53,000	.010000	.000750			
10,800	54,000	.011050	.001050			
11,000	55,000	.012050	.001000			
11,200	56,000	.013150	.001100			
11,400	57,000	.014500	.001350			
11,600	58,000	.015550	.001050			
11,800	59,000	.016550	.001000			
12,000	60,000	.017550	.001000			
12,400	62,000	.020150	.002600			
12,800	64,000	.022850	.002700			
13,200	66,000	.025650	.002800			
13,600	68,000	.029000	.003350			
14,000	70,000	.032550	.003550			
14,400	72,000	.036650	.004100			
14,800	74,000	.041250	.004600			
15,200	76,000	.046750	.005500			
15,600	78,000	.053250	.006500			
16,000	80,000	.061250	.008000			
16,400	82,000	.0750	.013750			
16,800	84,000	.0950	.0200			
17,120	85,600	.1400	.0450			Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	85,600
Elastic limit per square inch of original section	do....	48,000
Elongation per inch after rupture	inch..	0.2100
Elongation per inch under strain at elastic limit	do....	.001650
Reduction in diameter at point of rupture	do....	.075
Reduction in area after rupture, per centum of original section		27.4
Position of rupture		″.65 from neck
Character of broken surface, granular, 60 per cent.; silky flaky, 40 per cent. Opened cracks in surface of stem.		
Elongation of inch sections		″.18, ″.274

No. 3539.

Marks, $\frac{32\ R_{44}\ T}{B\ T_4\ M}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000150	.000150	0.	.....	
2,000	10,000	.000300	.000150	0.	.....	
3,000	15,000	.000450	.000150	0.	.....	
4,000	20,000	.000650	.000200	0.	.....	
5,000	25,000	.000800	.000150	0.	.....	
6,000	30,000	.000950	.000150	0.	.....	
7,000	35,000	.001100	.000150	0.	.....	
8,000	40,000	.001250	.000150	0.	.....	
9,000	45,000	.001450	.000200	.....	.....	Elastic limit.
9,200	46,000	.002250	.000800	.....	.....	
9,400	47,000	.002900	.000650	.....	.....	
9,600	48,000	.006250	.003350	.....	.....	
9,800	49,000	.007250	.001000	.....	.....	
10,000	50,000	.008100	.000850	.....	.....	
10,200	51,000	.008900	.000800	.....	.....	
10,400	52,000	.009750	.000850	.....	.....	
10,600	53,000	.010700	.000950	.....	.....	
10,800	54,000	.011900	.001200	.....	.....	
11,200	55,000	.014100	.002200	.....	.....	
11,600	58,000	.016100	.002000	.....	.....	
12,000	57,000	.019000	.002900	.....	.....	
12,400	62,000	.021100	.002100	.....	.....	
12,800	64,000	.023900	.002800	.....	.....	
13,200	66,000	.026750	.002850	.....	.....	
13,600	68,000	.030650	.003900	.....	.....	
14,000	70,000	.034050	.003400	.....	.....	
14,400	72,000	.038500	.004450	.....	.....	
14,800	74,000	.041250	.002750	.....	.....	
15,200	76,000	.049400	.008150	.....	.....	
15,600	78,000	.056750	.007350	.....	.....	
16,000	80,000	.0670	.010250	.....	.....	
16,400	82,000	.0850	.0180	.....	.....	
16,800	84,000	.1150	.0300	.....	.....	
16,900	84,500	.1450	.0300	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	84,500
Elastic limit per square inch of original section	do....	45,000
Elongation per inch after rupture	inch..	0.2500
Elongation per inch under strain at elastic limit	do....	.001450
Reduction in diameter at point of rupture	do....	.125
Reduction in area after rupture, per centum of original section		43.3
Position of rupture		1″ from neck
Character of broken surface		silky. Opened cracks in surface of stem
Elongation of inch sections		″.15, ″.35

No. 3426.

Marks, $\frac{32\ R_{40}\ T}{B\ T_1\ M}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	.....	
2,000	10,000	.000250	.000150	0.	.....	
3,000	15,000	.000450	.000200	0.	.....	
4,000	20,000	.000600	.000150	0.	.....	
5,000	25,000	.000800	.000200	0.	.....	
6,000	30,000	.000950	.000150	0.	.....	
7,000	35,000	.001100	.000150	0.	.....	
8,000	40,000	.001250	.000150	0.	.....	
9,000	45,000	.001450	.000200	.....	.....	
10,000	50,000	.001650	.000200	.....	.....	Elastic limit.
10,200	51,000	.007000	.005350	.....	.....	
10,400	52,000	.008500	.001500	.....	.....	
10,600	53,000	.009300	.000800	.....	.....	
10,800	54,000	.010100	.000800	.....	.....	
11,000	55,000	.011250	.001150	.....	.....	
11,200	56,000	.012350	.001100	.....	.....	
11,400	57,000	.013300	.000950	.....	.....	
11,600	58,000	.014250	.000950	.....	.....	
11,800	59,000	.015050	.000800	.....	.....	
12,000	60,000	.016050	.001000	.....	.....	
12,400	62,000	.018500	.002450	.....	.....	
12,800	64,000	.021000	.002500	.....	.....	
13,200	66,000	.023500	.002500	.....	.....	
13,600	68,000	.026050	.002550	.....	.....	
14,000	70,000	.029250	.003200	.....	.....	
14,400	72,000	.033250	.004000	.....	.....	
14,800	74,000	.037000	.003750	.....	.....	
15,200	76,000	.040850	.003850	.....	.....	
15,600	78,000	.046100	.005250	.....	.....	
16,000	80,000	.052500	.006400	.....	.....	
16,400	82,000	.061100	.008600	.....	.....	
16,800	84,000	.0750	.0139	.....	.....	
17,200	86,000	.0950	.0200	.....	.....	
17,420	87,100	.1400	.0450	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	87,100
Elastic limit per square inch of original section	do....	50,000
Elongation per inch after rupture	inch..	0.2100
Elongation per inch under strain at elastic limit	do....	.001650
Reduction in diameter at point of rupture	do....	.135
Reduction in area after rupture, per centum of original section		46.2
Position of rupture		″.65 from neck
Character of broken surface		silky
Elongation of inch sections		″.00, ″.33*

No. 3427.

Marks, $\frac{32\ R_{40}\ T}{B\ T_2\ M}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000150	.000150	0.	.....	
2,000	10,000	.000300	.000150	0.	.....	
3,000	15,000	.000450	.000150	0.	.....	
4,000	20,000	.000700	.000250	0.	.....	
5,000	25,000	.000850	.000150	0.	.....	
6,000	30,000	.001000	.000150	0.	.....	
7,000	35,000	.001150	.000150	0.	.....	
8,000	40,000	.001300	.000150	0.	.....	
9,000	45,000	.001450	.000150	.....	.....	
9,600	48,000	.001550	.000100	.....	.....	
9,800	49,000	.001650	.000100	.....	.....	Elastic limit.
10,000	50,000	.005000	.003350	.....	.....	
10,200	51,000	.007400	.002400	.....	.....	
10,400	52,000	.007900	.000500	.....	.....	
10,600	53,000	.008600	.000700	.....	.....	
10,800	54,000	.009600	.001000	.....	.....	
11,000	55,000	.010550	.000950	.....	.....	
11,200	56,000	.011500	.000950	.....	.....	
11,400	57,000	.012400	.000900	.....	.....	
11,600	58,000	.013500	.001100	.....	.....	
11,800	59,000	.014500	.001000	.....	.....	
12,000	60,000	.015600	.001100	.....	.....	
12,400	62,000	.018500	.002900	.....	.....	
12,800	64,000	.020500	.002000	.....	.....	
13,200	66,000	.022600	.002100	.....	.....	
13,600	68,000	.025400	.002800	.....	.....	
14,000	70,000	.028400	.003000	.....	.....	
14,400	72,000	.031750	.003350	.....	.....	
14,800	74,000	.035400	.003650	.....	.....	
15,200	76,000	.039550	.004150	.....	.....	
15,600	78,000	.044750	.005200	.....	.....	
16,000	80,000	.051250	.006500	.....	.....	
16,400	82,000	.0600	.008750	.....	.....	
16,800	84,000	.0650	.0050	.....	.....	
17,200	86,000	.0850	.0200	.....	.....	
17,570	87,850	.1350	.0500	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds	87,850
Elastic limit per square inch of original section	do	49,000
Elongation per inch after rupture	inch	0.2100
Elongation per inch under strain at elastic limit	do	.001650
Reduction in diameter at point of rupture	do	.135
Reduction in area after rupture, per centum of original section		46.2
Position of rupture		1″.10 from neck
Character of broken surface		silky
Elongation of inch sections		″.28*, ″.14

No. 3428.

Marks, $\frac{32\ \text{Re T}}{\text{M T, M}}$
Diameter, ".505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	.....	
2,000	10,000	.000300	.000200	0.	.....	
3,000	15,000	.000450	.000150	0.	.....	
4,000	20,000	.000650	.000200	0.	.....	
5,000	25,000	.000800	.000150	0.	.....	
6,000	30,000	.000950	.000150	0.	.....	
7,000	35,000	.001100	.000150	0.	.....	
8,000	40,000	.001350	.000250	0.	.....	
9,000	45,000	.001500	.000150	.....	.....	
9,600	48,000	.001600	.000100	.....	.....	Elastic limit.
9,800	49,000	.003400	.001800	.....	.....	
10,000	50,000	.004500	.001100	.....	.....	
10,200	51,000	.006900	.002400	.....	.....	
10,400	52,000	.007600	.000700	.....	.....	
10,600	53,000	.008500	.000900	.....	.....	
10,800	54,000	.009300	.000800	.....	.....	
11,000	55,000	.010050	.000750	.....	.....	
11,200	56,000	.011000	.000950	.....	.....	
11,400	57,000	.012050	.001050	.....	.....	
11,600	58,000	.013050	.001000	.....	.....	
11,800	59,000	.014100	.001050	.....	.....	
12,000	60,000	.015050	.000950	.....	.....	
12,400	62,000	.017200	.002150	.....	.....	
12,800	64,000	.019550	.002350	.....	.....	
13,200	66,000	.022000	.002450	.....	.....	
13,600	68,000	.024600	.002600	.....	.....	
14,000	70,000	.027500	.002900	.....	.....	
14,400	72,000	.030750	.003250	.....	.....	
14,800	74,000	.034250	.003500	.....	.....	
15,200	76,000	.038250	.004000	.....	.....	
15,600	78,000	.043100	.004850	.....	.....	
16,000	80,000	.049350	.006250	.....	.....	
16,400	82,000	.056500	.007150	.....	.....	
16,800	84,000	.0650	.0085	.....	.....	
17,200	86,000	.0850	.0200	.....	.....	
17,480	87,400	.1150	.0300	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	87,400
Elastic limit per square inch of original section	do ...	48,000
Elongation per inch after rupture	inch..	0.1000
Elongation per inch under strain at elastic limit	do....	.001600
Reduction in diameter at point of rupture	do....	.125
Reduction in area after rupture, per centum of original section		43.3
Position of rupture		".90 from neck
Character of broken surface		silky
Elongation of inch sections		".09, ".29*

No. 3429.

Marks, $\frac{32\ R_2\ T}{M\ T_2\ M}$
Diameter, ″.505.
Sectional area, .20 square inch.

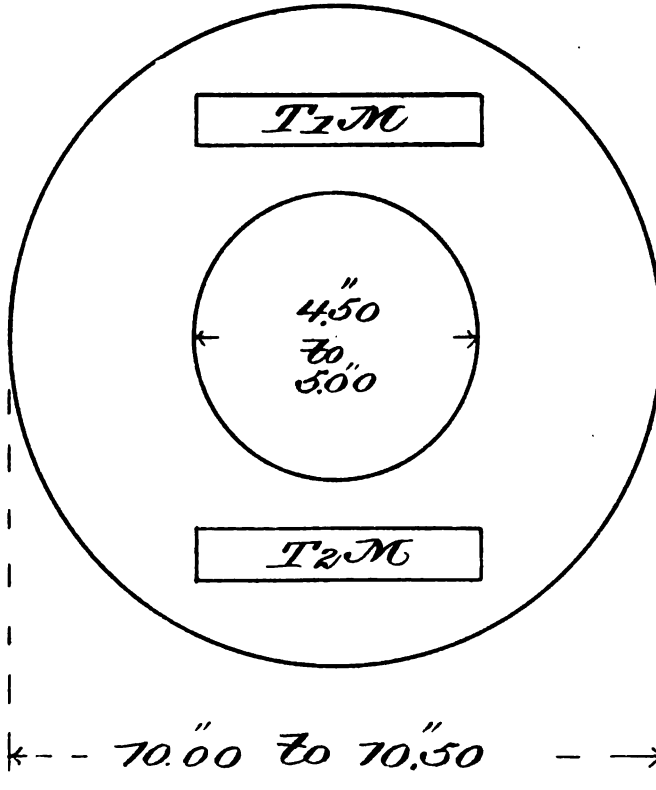
Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	.....	
2,000	10,000	.000300	.000200	0.	.....	
3,000	15,000	.000500	.000200	0.	.....	
4,000	20,000	.000650	.000150	0.	.....	
5,000	25,000	.000850	.000200	0.	.....	
6,000	30,000	.001000	.000150	0.	.....	
7,000	35,000	.001150	.000150	0.	.....	
8,000	40,000	.001350	.000200	0.	.....	
9,000	45,000	.001500	.000150	.....	.....	
9,600	48,000	.001650	.000150	.....	.....	
9,800	49,000	.001700	.000050	.....	.....	Elastic limit.
10,000	50,000	.006500	.004800	.....	.....	
10,200	51,000	.007200	.000700	.....	.....	
10,400	52,000	.007850	.000650	.....	.....	
10,600	53,000	.008850	.001000	.....	.....	
10,800	54,000	.009700	.000850	.....	.....	
11,000	55,000	.010750	.001050	.....	.....	
11,200	56,000	.011700	.000950	.....	.....	
11,400	57,000	.012600	.000900	.....	.....	
11,600	58,000	.013450	.000850	.....	.....	
11,800	59,000	.014500	.001050	.....	.....	
12,000	60,000	.015550	.001050	.....	.....	
12,400	62,000	.017750	.002200	.....	.....	
12,800	64,000	.020300	.002550	.....	.....	
13,200	66,000	.023000	.002700	.....	.....	
13,600	68,000	.025500	.002500	.....	.....	
14,000	70,000	.028400	.002900	.....	.....	
14,400	72,000	.031550	.003150	.....	.....	
14,800	74,000	.035250	.003700	.....	.....	
15,200	76,000	.039500	.004250	.....	.....	
15,600	78,000	.044400	.004900	.....	.....	
16,000	80,000	.050600	.006200	.....	.....	
16,400	82,000	.0575	.0069	.....	.....	
16,800	84,000	.0650	.0075	.....	.....	
17,200	86,000	.0850	.0200	.....	.....	
17,600	88,000	.1250	.0400	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	88,000
Elastic limit per square inch of original section	do....	49,000
Elongation per inch after rupture	inch.	0.1950
Elongation per inch under strain at elastic limit	do....	.001700
Reduction in diameter at point of rupture	do....	.125
Reduction in area after rupture, per centum of original section		43.3
Position of rupture		″.45 from neck
Character of broken surface		silky
Elongation of inch sections		″.28*, ″.11

3.2 inch Steel B.L. Rifles.

Jackets.



H Ex 45 50 2

JACKETS—3.2-INCH RIFLES.

No. 3563.

Marks, $\frac{32\ E_{21}\ J}{T_2\ M}$
Diameter, ".505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	.....	
2,000	10,000	.000300	.000200	0.	.....	
3,000	15,000	.000500	.000200	0.	.....	
4,000	20,000	.000650	.000150	0.	.....	
5,000	25,000	.000800	.000150	0.	.....	
6,000	30,000	.001000	.000200	0.	.....	
7,000	35,000	.001200	.000200	0.	.....	
8,000	40,000	.001400	.000200	0.	.....	
9,000	45,000	.001600	.000200	.....	.....	
9,200	46,000	.001650	.000050	.....	.....	
9,400	47,000	.001700	.000050	.....	.....	
9,600	48,000	.001750	.000050	.....	.....	
9,800	49,000	.001750	0.	.....	.....	
10,000	50,000	.001800	.000050	.....	.....	Elastic limit.
10,200	51,000	.002500	.000700	.....	.....	
10,400	52,000	.004500	.002000	.....	.....	
10,600	53,000	.005900	.001400	.....	.....	
10,800	54,000	.006950	.001050	.....	.....	
11,000	55,000	.007750	.000800	.....	.....	
11,200	56,000	.008900	.001150	.....	.....	
11,400	57,000	.009700	.000800	.....	.....	
11,600	58,000	.010400	.000700	.....	.....	
11,800	59,000	.011200	.000800	.....	.....	
12,000	60,000	.012150	.000950	.....	.....	
12,400	62,000	.014100	.001950	.....	.....	
12,800	64,000	.016250	.002150	.....	.....	
13,200	66,000	.018400	.002150	.....	.....	
13,600	68,000	.020750	.002350	.....	.....	
14,000	70,000	.023300	.002550	.....	.....	
14,400	72,000	.026250	.002950	.....	.....	
14,800	74,000	.028900	.002650	.....	.....	
15,200	76,000	.032000	.003100	.....	.....	
15,600	78,000	.036150	.004350	.....	.....	
16,000	80,000	.040350	.004000	.....	.....	
16,400	82,000	.045850	.005500	.....	.....	
16,800	84,000	.0525	.006650	.....	.....	
17,200	86,000	.0600	.0075	.....	.....	
17,600	88,000	.0700	.0100	.....	.....	
18,000	90,000	.1000	.0300	.....	.....	
18,170	90,850	.1400	.0400	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	90,850
Elastic limit per square inch of original section	do....	50,000
Elongation per inch after rupture	inch..	0.1900
Elongation per inch under strain at elastic limit	do....	.001800
Reduction in diameter at point of rupture	do....	.065
Reduction in area after rupture, per centum of original section		23.9
Position of rupture		1".10 from neck
Character of broken surface		granular; silky spot at the circumference
Elongation of inch sections		".21*, ".17

No. 3564.

Marks, $\frac{32\ R_{28}\ J}{T,\ M}$
Diameter, ".505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	.....	
2,000	10,000	.000250	.000150	0.	.....	
3,000	15,000	.000400	.000150	0.	.....	
4,000	20,000	.000600	.000200	0.	.....	
5,000	25,000	.000800	.000200	0.	.....	
6,000	30,000	.000950	.000150	0.	.....	
7,000	35,000	.001100	.000150	0.	.....	
8,000	40,000	.001250	.000150	0.	.....	
9,000	45,000	.001450	.000200	.....	.....	
9,200	46,000	.001500	.000050	.....	.....	
9,400	47,000	.001500	0.	.....	.....	
9,600	48,000	.001600	.000100	.....	.....	
9,800	49,000	.001650	.000050	.....	.....	
10,000	50,000	.001650	0.	.....	.....	
10,200	51,000	.001750	.000100	.....	.....	Elastic limit.
10,400	52,000	.003250	.001500	.....	.....	
10,600	53,000	.004750	.001500	.....	.....	
10,800	54,000	.006250	.001500	.....	.....	
11,000	55,000	.007000	.000750	.....	.....	
11,200	56,000	.007800	.000800	.....	.....	
11,400	57,000	.008500	.000700	.....	.....	
11,600	58,000	.009500	.001000	.....	.....	
11,800	59,000	.010250	.000750	.....	.....	
12,000	60,000	.011200	.000950	.....	.....	
12,400	62,000	.013000	.001800	.....	.....	
12,800	64,000	.015050	.002050	.....	.....	
13,200	66,000	.017100	.002050	.....	.....	
13,600	68,000	.019350	.002250	.....	.....	
14,000	70,000	.021750	.002400	.....	.....	
14,400	72,000	.024150	.002400	.....	.....	
14,800	74,000	.027000	.002850	.....	.....	
15,200	76,000	.029800	.002800	.....	.....	
15,600	78,000	.033250	.003450	.....	.....	
16,000	80,000	.037100	.003850	.....	.....	
16,400	82,000	.041600	.004500	.....	.....	
16,800	84,000	.047250	.005650	.....	.....	
17,200	86,000	.054500	.007250	.....	.....	
17,660	88,000	.0600	.0055	.....	.....	
18,000	90,000	.0750	.0150	.....	.....	
18,400	92,000	.1000	.0250	.....	.....	
18,520	92,600	.1400	.0400	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	92,600
Elastic limit per square inch of original section	do....	51,000
Elongation per inch after rupture	inch..	0.1950
Elongation per inch under strain at elastic limit	do....	.001750
Reduction in diameter at point of rupture	do....	.105
Reduction in area after rupture, per centum of original section		37.1
Position of rupture		".75 from neck
Character of broken surface	granular, 40 per cent.; silky, 60 per cent.	
Elongation of inch sections		".11, ".28

No. 3601.

Marks, $\frac{32\,R_{27}\,J}{T_5\,M}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads. Total.	Applied loads. Per square inch.	Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	.....	
2,000	10,000	.000250	.000150	0.	.....	
3,000	15,000	.000450	.000200	0.	.....	
4,000	20,000	.000600	.000150	0.	.....	
5,000	25,000	.000750	.000150	0.	.....	
6,000	30,000	.000950	.000200	0.	.....	
7,000	35,000	.001100	.000150	0.	.....	
8,000	40,000	.001250	.000150	0.	.....	
9,000	45,000	.001400	.000150	.....	.....	
9,200	46,000	.001450	.000050	.....	.....	
9,400	47,000	.001500	.000050	.....	.....	
9,600	48,000	.001550	.000050	.....	.....	
9,800	49,000	.001600	.000050	.....	.....	
10,000	50,000	.001650	.000050	.....	.....	
10,200	51,000	.001700	.000050	.....	.....	
10,400	52,000	.001800	.000100	.....	.....	Elastic limit.
10,600	53,000	.002650	.000850	.....	.....	
10,800	54,000	.003800	.001150	.....	.....	
11,000	55,000	.004650	.000850	.....	.....	
11,200	56,000	.005250	.000600	.....	.....	
11,400	57,000	.005850	.000600	.....	.....	
11,600	58,000	.006600	.000750	.....	.....	
11,800	59,000	.007500	.000900	.....	.....	
12,000	60,000	.008500	.001000	.....	.....	
12,400	62,000	.010000	.001500	.....	.....	
12,800	64,000	.011500	.001500	.....	.....	
13,200	66,000	.013250	.001750	.....	.....	
13,600	68,000	.015000	.001750	.....	.....	
14,000	70,000	.016550	.001550	.....	.....	
14,400	72,000	.019000	.002450	.....	.....	
14,800	74,000	.021500	.002500	.....	.....	
15,200	76,000	.023000	.001500	.....	.....	
15,600	78,000	.026000	.003000	.....	.....	
16,000	80,000	.029000	.003000	.....	.....	
16,400	82,000	.032000	.003000	.....	.....	
16,800	84,000	.035250	.003250	.....	.....	
17,200	86,000	.038250	.003000	.....	.....	
17,600	88,000	.042150	.003900	.....	.....	
18,000	90,000	.046000	.003850	.....	.....	
18,400	92,000	.051500	.005500	.....	.....	
18,800	94,000	.058500	.007000	.....	.....	
19,200	96,000	.068250	.009750	.....	.....	
19,600	98,000	.0900	.021750	.....	.....	
20,000	100,000	.1300	.0400	.....	.....	
20,020	100,100	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	100,100
Elastic limit per square inch of original section	do....	52,000
Elongation per inch after rupture	inch..	0.2050
Elongation per inch under strain at elastic limit	do....	.001800
Reduction in diameter at point of rupture	do....	.105
Reduction in area after rupture, per centum of original section		37.1
Position of rupture		″.85 from neck
Character of broken surface		silky, interspersed with granular metal
Elongation of inch sections		″.12, ″.29*

No. 3602.

Marks, $\frac{32\ R_{27}\ J}{T_6\ M}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	.....	
2,000	10,000	.000250	.000150	0.	.....	
3,000	15,000	.000400	.000150	0.	.....	
4,000	20,000	.000600	.000200	0.	.....	
5,000	25,000	.000750	.000150	0.	.....	
6,000	30,000	.000950	.000200	0.	.....	
7,000	35,000	.001100	.000150	0.	.....	
8,000	40,000	.001300	.000200	0.	.....	
9,000	45,000	.001500	.000200	.....	.....	
9,200	46,000	.001500	0.	.....	.....	
9,400	47,000	.001550	.000050	.....	.....	
9,600	48,000	.001600	.000050	.....	.....	
9,800	49,000	.001600	0.	.....	.....	
10,000	50,000	.001650	.000050	.....	.....	
10,200	51,000	.001700	.000050	.....	.....	
10,400	52,000	.001750	.000050	.....	.....	Elastic limit.
10,600	53,000	.002500	.000750	.....	.....	
10,800	54,000	.004000	.001500	.....	.....	
11,000	55,000	.004750	.000750	.....	.....	
11,200	56,000	.005300	.000550	.....	.....	
11,400	57,000	.006100	.000800	.....	.....	
11,600	58,000	.006750	.000650	.....	.....	
11,800	59,000	.008100	.001350	.....	.....	
12,000	60,000	.009500	.001400	.....	.....	
12,400	62,000	.010600	.001100	.....	.....	
12,800	64,000	.011900	.001300	.....	.....	
13,200	66,000	.013500	.001600	.....	.....	
13,600	68,000	.015650	.002150	.....	.....	
14,000	70,000	.017900	.002250	.....	.....	
14,400	72,000	.020250	.002350	.....	.....	
14,800	74,000	.022100	.001850	.....	.....	
15,200	76,000	.024250	.002150	.....	.....	
15,600	78,000	.027000	.002750	.....	.....	
16,000	80,000	.029250	.002250	.....	.....	
16,400	82,000	.031850	.002600	.....	.....	
16,800	84,000	.034600	.002750	.....	.....	
17,200	86,000	.037900	.003300	.....	.....	
17,600	88,000	.042350	.004450	.....	.....	
18,000	90,000	.047500	.005150	.....	.....	
18,400	92,000	.054000	.006500	.....	.....	
18,800	94,000	.061250	.007250	.....	.....	
19,200	96,000	.072250	.011000	.....	.....	
19,600	98,000	.0950	.022750	.....	.....	
19,830	99,150	.1350	.0400	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	99,150
Elastic limit per square inch of original section	do....	52,000
Elongation per inch after rupture	inch..	0.2100
Elongation per inch under strain at elastic limit	do....	.001750
Reduction in diameter at point of rupture	do....	.105
Reduction in area after rupture, per centum of original section		37.1
Position of rupture		″.65 from neck
Character of broken surface	silky; in part granular at the circumference	
Elongation of inch sections		″.29*, ″.13

No. 3510.

Marks, $\frac{35\ E_{20}\ J}{T_2\ M}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	.....	
2,000	10,000	.000300	.000200	0.	.....	
3,000	15,000	.000450	.000150	0.	.....	
4,000	20,000	.000650	.000200	0.	.....	
5,000	25,000	.000800	.000150	0.	.....	
6,000	30,000	.000950	.000150	0.	.....	
7,000	35,000	.001100	.000150	0.	.....	
8,000	40,000	.001300	.000200	0.	.....	
9,000	45,000	.001450	.000150	.....	.....	
10,000	50,000	.001600	.000150	.....	.....	
10,200	51,000	.001650	.000050	.....	.....	
10,400	52,000	.001750	.000100	.....	.....	
10,600	53,000	.001850	.000100	.....	.....	
10,800	54,000	.001950	.000100	.....	.....	Elastic limit.
11,000	55,000	.003100	.001150	.....	.....	
11,200	56,000	.004600	.001500	.....	.....	
11,400	57,000	.005750	.001150	.....	.....	
11,600	58,000	.006900	.001150	.....	.....	
11,800	59,000	.007750	.000850	.....	.....	
12,000	60,000	.008750	.001000	.....	.....	
12,400	62,000	.010550	.001800	.....	.....	
12,800	64,000	.012750	.002200	.....	.....	
13,200	66,000	.015000	.002250	.....	.....	
13,600	68,000	.017250	.002250	.....	.....	
14,000	70,000	.019250	.002000	.....	.....	
14,400	72,000	.021750	.002500	.....	.....	
14,800	74,000	.024250	.002500	.....	.....	
15,200	76,000	.027150	.002900	.....	.....	
15,600	78,000	.030100	.002950	.....	.....	
16,000	80,000	.033350	.003250	.....	.....	
16,400	82,000	.037900	.004550	.....	.....	
16,800	84,000	.042400	.004500	.....	.....	
17,200	86,000	.047900	.005500	.....	.....	
17,600	88,000	.055500	.007600	.....	.....	
18,000	90,000	.0625	.0070	.....	.....	
18,400	92,000	.0850	.0225	.....	.....	
18,670	93,350	.1250	.0400	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	93,350
Elastic limit per square inch of original section	do....	54,000
Elongation per inch after rupture	inch..	.2000
Elongation per inch under strain at elastic limit	do....	.001950
Reduction in diameter at point of rupture	do....	.085
Reduction in area after rupture, per centum of original section		30.7
Position of rupture		1″.15 from neck
Character of broken surface	granular; dull spot at circumference	
Elongation of inch sections		″.21*, ″.19

No. 3511.

Marks, $\frac{32\ \text{Res}\ J}{T_4\ M}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000150	.000150	0.		
2,000	10,000	.000300	.000150	0.		
3,000	15,000	.000500	.000200	0.		
4,000	20,000	.000700	.000200	0.		
5,000	25,000	.000850	.000150	0.		
6,000	30,000	.001000	.000150	0.		
7,000	35,000	.001200	.000200	0.		
8,000	40,000	.001350	.000150	0		
9,000	45,000	.001500	.000150			
10,000	50,000	.001750	.000250			Elastic limit.
10,200	51,000	.001900	.000150			
10,400	52,000	.003300	.001400			
10,600	53,000	.004500	.001200			
10,800	54,000	.005550	.001050			
11,000	55,000	.006500	.000950			
11,200	56,000	.007500	.001000			
11,400	57,000	.008600	.001100			
11,600	58,000	.009550	.000950			
11,800	59,000	.010400	.000850			
12,000	60,000	.011550	.001150			
12,400	62,000	.013000	.001450			
12,800	64,000	.015100	.002100			
13,200	66,000	.017200	.002100			
13,600	68,000	.019500	.002300			
14,000	70,000	.021900	.002400			
14,400	72,000	.024550	.002650			
14,800	74,000	.027600	.003050			
15,200	76,000	.030250	.002650			
15,600	78,000	.034000	.003750			
16,000	80,000	.038100	.004100			
16,400	82,000	.043000	.004900			
16,800	84,000	.049500	.006500			
17,200	86,000	.0550	.0055			
17,600	88,000	.0650	.0100			
18,000	90,000	.0850	.0200			
18,220	91,100	.1250	.0400			Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	91,100
Elastic limit per square inch of original section	do....	50,000
Elongation per inch after rupture	inch .	0.2100
Elongation per inch under strain at elastic limit	do....	.001750
Reduction in diameter at point of ruptnre	do....	.115
Reduction in area after rupture, per centum of original section		40.3
Position of rupture		1″ from neck
Character of broken surface		silky
Elongation of inch sections		″.29*, ″.13

No. 3412.

Marks, $\frac{32\ R_{22}\ J}{T_2\ M}$
Diameter, ".505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	.....	
2,000	10,000	.000350	.000250	0.	.....	
3,000	15,000	.000500	.000150	0.	.....	
4,000	20,000	.000650	.000150	0.	.....	
5,000	25,000	.000850	.000200	0.	.....	
6,000	30,000	.001000	.000150	0.	.....	
7,000	35,000	.001150	.000150	0.	.....	
8,000	40,000	.001350	.000200	0.	.....	
9,000	45,000	.001550	.000200	.....	.....	
9,200	46,000	.001550	0.	.....	.....	
9,400	47,000	.001600	.000050	.....	.....	
9,600	48,000	.001650	.000050	.....	.....	
9,800	49,000	.001650	0.	.....	.....	
10,000	50,000	.001700	.000050	.....	.....	
10,200	51,000	.001750	.000050	.....	.....	
10,400	52,000	.001850	.000100	.....	.....	
10,600	53,000	.001850	0.	.....	.....	
10,800	54,000	.001900	.000050	.....	.....	Elastic limit.
11,000	55,000	.003000	.001100	.....	.....	
11,200	56,000	.004250	.001250	.....	.....	
11,400	57,000	.005350	.001100	.....	.....	
11,600	58,000	.006350	.001000	.....	.....	
11,800	59,000	.007500	.001150	.....	.....	
12,000	60,000	.008300	.000800	.....	.....	
12,400	62,000	.010150	.001850	.....	.....	
12,800	64,000	.012050	.001900	.....	.....	
13,200	66,000	.013900	.001850	.....	.....	
13,600	68,000	.015900	.002000	.....	.....	
14,000	70,000	.017900	.002000	.....	.....	
14,400	72,000	.020300	.002400	.....	.....	
14,800	74,000	.022900	.002600	.....	.....	
15,200	76,000	.025250	.002350	.....	.....	
15,600	78,000	.028250	.003000	.....	.....	
16,000	80,000	.031250	.003000	.....	.....	
16,400	82,000	.034750	.003500	.....	.....	
16,800	84,000	.038900	.004150	.....	.....	
17,200	86,000	.043500	.004600	.....	.....	
17,600	88,000	.049750	.006250	.....	.....	
18,000	90,000	.057500	.007750	.....	.....	
18,400	92,000	.0750	.0175	.....	.....	
18,800	94,000	.0900	.0150	.....	.....	
18,960	94,800	.1200	.0300	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	94,800
Elastic limit per square inch of original section	do....	54,000
Elongation per inch after rupture	inch..	0.1850
Elongation per inch under strain at elastic limit	do....	.001900
Reduction in diameter at point of rupture	do....	.085
Reduction in area after rupture, per centum of original section		30.7
Position of rupture		".90 from neck
Character of broken surface		granular, 70 per cent.; silky, 30 per cent.
Elongation of inch sections		".10, ".27*

No. 3511.

Marks, $\frac{32\ R_{33}\ J}{T_4\ M}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000150	.000150	0.		
2,000	10,000	.000300	.000150	0.		
3,000	15,000	.000500	.000200	0.		
4,000	20,000	.000700	.000200	0.		
5,000	25,000	.000850	.000150	0.		
6,000	30,000	.001000	.000150	0.		
7,000	35,000	.001200	.000200	0.		
8,000	40,000	.001350	.000150	0		
9,000	45,000	.001500	.000150			
10,000	50,000	.001750	.000250			Elastic limit.
10,200	51,000	.001900	.000150			
10,400	52,000	.003300	.001400			
10,600	53,000	.004500	.001200			
10,800	54,000	.005550	.001050			
11,000	55,000	.006500	.000950			
11,200	56,000	.007500	.001000			
11,400	57,000	.008600	.001100			
11,600	58,000	.009550	.000950			
11,800	59,000	.010400	.000850			
12,000	60,000	.011550	.001150			
12,400	62,000	.013000	.001450			
12,800	64,000	.015100	.002100			
13,200	66,000	.017200	.002100			
13,600	68,000	.019500	.002300			
14,000	70,000	.021900	.002400			
14,400	72,000	.024550	.002650			
14,800	74,000	.027600	.003050			
15,200	76,000	.030250	.002650			
15,600	78,000	.034000	.003750			
16,000	80,000	.038100	.004100			
16,400	82,000	.043000	.004900			
16,800	84,000	.049500	.006500			
17,200	86,000	.0550	.0055			
17,600	88,000	.0650	.0100			
18,000	90,000	.0850	.0200			
18,220	91,100	.1250	.0400			Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	91,100
Elastic limit per square inch of original section	do....	50,000
Elongation per inch after rupture	inch .	0.2100
Elongation per inch under strain at elastic limit	do....	.001750
Reduction in diameter at point of rupture	do....	.115
Reduction in area after rupture, per centum of original section		40.3
Position of rupture		1″ from neck
Character of broken surface		silky
Elongation of inch sections		″.29⁴, ″.13

No. 3412.

Marks, $\frac{32\ R_R\ J}{T_S\ H}$
Diameter, ".505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	.....	
2,000	10,000	.000850	.000250	0.	.....	
3,000	15,000	.000500	.000150	0.	.....	
4,000	20,000	.000650	.000150	0.	.....	
5,000	25,000	.000850	.000200	0.	.....	
6,000	30,000	.001000	.000150	0.	.....	
7,000	35,000	.001150	.000150	0.	.....	
8,000	40,000	.001350	.000200	0.	.....	
9,000	45,000	.001550	.000200	.....	.....	
9,200	46,000	.001550	0.	.....	.....	
9,400	47,000	.001600	.000050	.....	.....	
9,600	48,000	.001650	.000050	.....	.....	
9,800	49,000	.001650	0.	.....	.....	
10,000	50,000	.001700	.000050	.....	.....	
10,200	51,000	.001750	.000050	.....	.....	
10,400	52,000	.001850	.000100	.....	.....	
10,600	53,000	.001850	0.	.....	.....	
10,800	54,000	.001900	.000050	.....	.....	Elastic limit.
11,000	55,000	.003000	.001100	.....	.....	
11,200	56,000	.004250	.001250	.....	.....	
11,400	57,000	.005350	.001100	.....	.....	
11,600	58,000	.006350	.001000	.....	.....	
11,800	59,000	.007500	.001150	.....	.....	
12,000	60,000	.008300	.000800	.....	.....	
12,400	62,000	.010150	.001850	.....	.....	
12,800	64,000	.012050	.001900	.....	.....	
13,200	66,000	.013900	.001850	.....	.....	
13,600	68,000	.015900	.002000	.....	.....	
14,000	70,000	.017900	.002000	.....	.....	
14,400	72,000	.020300	.002400	.....	.....	
14,800	74,000	.022900	.002600	.....	.....	
15,200	76,000	.025250	.002350	.....	.....	
15,600	78,000	.028250	.003000	.....	.....	
16,000	80,000	.031250	.003000	.....	.....	
16,400	82,000	.034750	.003500	.....	.....	
16,800	84,000	.038900	.004150	.....	.....	
17,200	86,000	.043500	.004600	.....	.....	
17,600	88,000	.049750	.006250	.....	.....	
18,000	90,000	.057500	.007750	.....	.....	
18,400	92,000	.0750	.0175	.....	.....	
18,800	94,000	.0900	.0150	.....	.....	
18,960	94,800	.1200	.0300	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	94,800
Elastic limit per square inch of original section	do....	54,000
Elongation per inch after rupture	inch..	0.1850
Elongation per inch under strain at elastic limit	do....	.001900
Reduction in diameter at point of rupture	do....	.085
Reduction in area after rupture, per centum of original section		30.7
Position of rupture		".90 from neck
Character of broken surface		granular, 70 per cent.; silky, 30 per cent.
Elongation of inch sections		".10, ".27*

No. 3413.

Marks, $\frac{32\ R_{22}\ J}{T_4\ M}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	.....	
2,000	10,000	.000300	.000200	0.	.....	
3,000	15,000	.000450	.000150	0.	.....	
4,000	20,000	.000600	.000150	0.	.....	
5,000	25,000	.000750	.000150	0.	.....	
6,000	30,000	.000950	.000200	0.	.....	
7,000	35,000	.001100	.000150	0.	.....	
8,000	40,000	.001250	.000150	0.	.....	
9,000	45,000	.001450	.000200	.....	.....	
10,000	50,000	.001600	.000150	.....	.....	
10,200	51,000	.001650	.000050	.....	.....	Elastic limit.
10,400	52,000	.001800	.000150	.....	.....	
10,600	53,000	.002400	.000600	.....	.....	
10,800	54,000	.003350	.000950	.....	.....	
11,000	55,000	.004250	.000900	.....	.....	
11,200	56,000	.005100	.000850	.....	.....	
11,400	57,000	.005850	.000750	.....	.....	
11,600	58,000	.006650	.000800	.....	.....	
11,800	59,000	.007550	.000900	.....	.....	
12,000	60,000	.008200	.000650	.....	.....	
12,400	62,000	.010000	.001800	.....	.....	
12,800	64,000	.011750	.001750	.....	.....	
13,200	66,000	.013550	.001800	.....	.....	
13,600	68,000	.015100	.001550	.....	.....	
14,000	70,000	.017000	.001900	.....	.....	
14,400	72,000	.019050	.002050	.....	.....	
14,800	74,000	.021500	.002450	.....	.....	
15,200	76,000	.023500	.002000	.....	.....	
15,600	78,000	.026250	.002750	.....	.....	
16,000	80,000	.028500	.002250	.....	.....	
16,400	82,000	.031750	.003250	.....	.....	
16,800	84,000	.035150	.003400	.....	.....	
17,200	86,000	.039000	.003850	.....	.....	
17,600	88,000	.043150	.004150	.....	.....	
18,000	90,000	.048550	.005400	.....	.....	
18,400	92,000	.055500	.006950	.....	.....	
18,800	94,000	.0650	.0095	.....	.....	
19,200	96,000	.0800	.0150	.....	.....	
19,550	97,750	.1200	.0400	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	97,750
Elastic limit per square inch of original section	do....	51,000
Elongation per inch after rupture	inch..	0.2100
Elongation per inch under strain at elastic limit	do....	.001650
Reduction in diameter at point of rupture	do....	.105
Reduction in area after rupture, per centum of original section		37.1
Position of rupture		″.70 from neck
Character of broken surface		silky; trace of granulation
Elongation of inch sections		″.12, ″.30*

No. 3414.

Marks, $\frac{32\ R_{B}\ J}{T_{2}\ M}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000150	.000150	0.		
2,000	10,000	.000300	.000300	0.		
3,000	15,000	.000500	.000200	0.		
4,000	20,000	.000700	.000200	0.		
5,000	25,000	.000850	.000150	0.		
6,000	30,000	.001050	.000200	0.		
7,000	35,000	.001200	.000150	0.		
8,000	40,000	.001400	.000200	0.		
9,000	45,000	.001550	.000150			
10,000	50,000	.001800	.000250			Elastic limit.
10,200	51,000	.002000	.000200			
10,400	52,000	.002900	.000900			
10,600	53,000	.004100	.001200			
10,800	54,000	.005100	.001000			
11,000	55,000	.005900	.000800			
11,200	56,000	.006650	.000750			
11,400	57,000	.007400	.000750			
11,600	58,000	.008100	.000700			
11,800	59,000	.009000	.000900			
12,000	60,000	.009750	.000750			
12,400	62,000	.011550	.001800			
12,800	64,000	.013400	.001850			
13,200	66,000	.015050	.001650			
13,600	68,000	.017050	.002000			
14,000	70,000	.018750	.001700			
14,400	72,000	.021000	.002250			
14,800	74,000	.023250	.002250			
15,200	76,000	.025350	.002100			
15,600	78,000	.028500	.003150			
16,000	80,000	.031100	.002600			
16,400	82,000	.034500	.003400			
16,800	84,000	.038250	.003750			
17,200	86,000	.042550	.004300			
17,600	88,000	.047800	.005250			
18,000	90,000	.0550	.0072			
18,400	92,000	.0600	.0050			
18,800	94,000	.0800	.0200			
19,200	96,000	.1050	.0250			
19,250	96,250	.1400	.0350			Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	96,250
Elastic limit per square inch of original section	do....	50,000
Elongation per inch after rupture	inch..	0.1050
Elongation per inch under strain at elastic limit	do....	.001800
Reduction in diameter at point of rupture	do....	.065
Reduction in area after rupture, per centum of original section		23.9
Position of rupture		″.65 from neck
Character of broken surface		granular, radiating from a dull spot at the circumference
Elongation of inch sections		″.11.″.22*

No. 3415.

Marks, $^{32}\frac{R_3 J}{T_4 M}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000150	.000150	0.		
2,000	10,000	.000300	.000150	0.		
3,000	15,000	.000450	.000150	0.		
4,000	20,000	.000650	.000200	0.		
5,000	25,000	.000800	.000150	0.		
6,000	30,000	.001000	.000200	0.		
7,000	35,000	.001200	.000200	0.		
8,000	40,000	.001400	.000200	0.		
9,000	45,000	.001550	.000150			
9,200	46,000	.001600	.000050			
9,400	47,000	.001650	.000050			
9,600	48,000	.001700	.000050			
9,800	49,000	.001750	.000050			
10,000	50,000	.001800	.000050			
10,200	51,000	.001900	.000100			Elastic limit.
10,400	52,000	.002850	.000950			
10,600	53,000	.004600	.001750			
10,800	54,000	.005750	.001150			
11,000	55,000	.006500	.000750			
11,200	56,000	.0 7500	.001000			
11,400	57,000	.008150	.000650			
11,600	58,000	.009000	.000850			
11,800	59,000	.009750	.000750			
12,000	60,000	.010500	.000750			
12,400	62,000	.012400	.001900			
12,800	64,000	.014000	.001600			
13,200	66,000	.015000	.001000			
13,600	68,000	.017550	.001950			
14,000	70,000	.019250	.001700			
14,400	72,000	.021650	.002400			
14,800	74,000	.024050	.002400			
15,200	76,000	.026500	.002450			
15,600	78,000	.029000	.002500			
16,000	80,000	.031900	.002900			
16,400	82,000	.035400	.003500			
16,800	84,000	.039100	.003700			
17,200	86,000	.043500	.004400			
17,600	88,000	.048500	.005000			
18,000	90,000	.0560	.0075			
18,400	92,000	.0650	.0090			
18,800	94,000	.0800	.0150			
19,270	96,350	.1300	.0500			Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	96,350
Elastic limit per square inch of original section	do....	51,000
Elongation per inch after rupture	inch..	0.2050
Elongation per inch under strain at elastic limit	do....	.001900
Reduction in diameter at point of rupture	do....	.095
Reduction in area after rupture, per centum of original section		34.0
Position of rupture		″.65 from neck
Character of broken surface		silky, 50 per cent.; granular, 50 per cent.
Elongation of inch sections		″.29*, ″.12

No. 3508.

Marks, $\frac{32\ Rn\ J}{T_5\ M}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000150	.000150	0.	.....	
2,000	10,000	.000300	.000300	0.	.....	
3,000	15,000	.000450	.000150	0.	.....	
4,000	20,000	.000650	.000200	0.	.....	
5,000	25,000	.000850	.000200	0.	.....	
6,000	30,000	.001000	.000150	0.	.....	
7,000	35,000	.001200	.000200	0.	.....	
8,000	40,000	.001350	.000150	0.	.....	
9,000	45,000	.001500	.000150	.....	.....	
10,000	50,000	.001800	.000300	.....	.....	
10,200	51,000	.001850	.000050	.....	.....	Elastic limit.
10,400	52,000	.002100	.000250	.....	.....	
10,600	53,000	.004500	.002400	.....	.....	
10,800	54,000	.005350	.000850	.....	.....	
11,000	55,000	.006400	.001050	.....	.....	
11,200	56,000	.007100	.000700	.....	.....	
11,400	57,000	.008000	.000900	.....	.....	
11,600	58,000	.008900	.000900	.....	.....	
11,800	59,000	.009650	.000750	.....	.....	
12,000	60,000	.010550	.000900	.....	.....	
12,400	62,000	.012400	.001850	.....	.....	
12,800	64,000	.014200	.001800	.....	.....	
13,200	66,000	.016250	.002050	.....	.....	
13,600	68,000	.018100	.001850	.....	.....	
14,000	70,000	.020250	.002150	.....	.....	
14,400	72,000	.022650	.002400	.....	.....	
14,800	74,000	.025050	.002400	.....	.....	
15,200	76,000	.027600	.002550	.....	.....	
15,600	78,000	.030600	.003000	.....	.....	
16,000	80,000	.034000	.003400	.....	.....	
16,400	82,000	.037750	.003750	.....	.....	
16,800	84,000	.042100	.004250	.....	.....	
17,200	86,000	.047000	.004900	.....	.....	
17,600	88,000	.054000	.007000	.....	.....	
18,000	90,000	.0600	.0060	.....	.....	
18,400	92,000	.0750	.0150	.....	.....	
18,800	94,000	.1000	.0250	.....	.....	
18,960	94,800	.1350	.0350	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	94,800
Elastic limit per square inch of original section	do....	51,000
Elongation per inch after rupture	inch..	0.2100
Elongation per inch under strain at elastic limit	do....	.001850
Reduction in diameter at point of rupture	do....	.085
Reduction in area after rupture, per centum of original section		30.7
Position of rupture		1″ from neck
Character of broken surface	granular, 70 per cent.; silky, 30 per cent.	
Elongation of inch sections		″.18, ″.24*

No. 3509.

Marks, $\frac{32\ R_{22}\ J}{T_5\ M}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	.....	
2,000	10,000	.000250	.000150	0.	.....	
3,000	15,000	.000450	.000200	0.	.....	
4,000	20,000	.000600	.000150	0.	.....	
5,000	25,000	.000750	.000150	0.	.....	
6,000	30,000	.000950	.000200	0.	.....	
7,000	35,000	.001100	.000150	0.	.....	
8,000	40,000	.001300	.000200	0.	.....	
9,000	45,000	.001450	.000150	.....	.....	
10,000	50,000	.001700	.000250	.....	.....	
10,200	51,000	.001750	.000050	.....	.....	
10,400	52,000	.001850	.000100	.....	.....	Elastic limit.
10,600	53,000	.002050	.000200	.....	.....	
10,800	54,000	.002800	.000750	.....	.....	
11,000	55,000	.003700	.000900	.....	.....	
11,200	56,000	.004550	.000850	.....	.....	
11,400	57,000	.005350	.000800	.....	.....	
11,600	58,000	.006100	.000750	.....	.....	
11,800	59,000	.007000	.000900	.....	.....	
12,000	60,000	.007850	.000850	.....	.....	
12,400	62,000	.009500	.001650	.....	.....	
12,800	64,000	.011050	.001550	.....	.....	
13,200	66,000	.012750	.001700	.....	.....	
13,600	68,000	.014400	.001650	.....	.....	
14,000	70,000	.016100	.001700	.....	.....	
14,400	72,000	.018050	.001950	.....	.....	
14,800	74,000	.020050	.002000	.....	.....	
15,200	76,000	.022100	.002050	.....	.....	
15,600	78,000	.024400	.002300	.....	.....	
16,000	80,000	.027000	.002600	.....	.....	
16,400	82,000	.029600	.002600	.....	.....	
16,800	84,000	.032500	.002900	.....	.....	
17,200	86,000	.035850	.003350	.....	.....	
17,600	88,000	.039600	.003750	.....	.....	
18,000	90,000	.044250	.004650	.....	.....	
18,400	92,000	.049750	.005500	.....	.....	
18,800	94,000	.0550	.005250	.....	.....	
19,200	96,000	.0625	.0075	.....	.....	
19,600	98,000	.0800	.0175	.....	.....	
19,900	99,500	.1300	.0500	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	99,500
Elastic limit per square inch of original section	do....	52,000
Elongation per inch after rupture	inch..	0.1950
Elongation per inch under strain at elastic limit	do....	.001850
Reduction in diameter at point of rupture	do....	.085
Reduction in area after rupture, per centum of original section		30.7
Position of rupture		″.90 from neck
Character of broken surface		granular, 60 per cent.; dull silky, 40 per cent.
Elongation of inch sections		″.15, ″.24*

No. 3408.

Marks, $\frac{32\ Res\ J}{T_1\ M}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000150	.000150	0.	.....	
2,000	10,000	.000300	.000150	0.	.....	
3,000	15,000	.000450	.000150	0.	.....	
4,000	20,000	.000650	.000200	0.	.....	
5,000	25,000	.000850	.000200	0.	.....	
6,000	30,000	.000950	.000100	0.	.....	
7,000	35,000	.001150	.000200	0.	.....	
8,000	40,000	.001350	.000200	0.	.....	
9,000	45,000	.001500	.000150	.....	.....	
9,200	46,000	.001550	.000050	.....	.....	
9,400	47,000	.001650	.000100	.....	.....	
9,600	48,000	.001700	.000050	.....	.....	Elastic limit.
9,800	49,000	.001850	.000150	.....	.....	
10,000	50,000	.002000	.001150	.....	.....	
10,200	51,000	.004000	.001000	.....	.....	
10,400	52,000	.005000	.001000	.....	.....	
10,600	53,000	.005500	.000500	.....	.....	
10,800	54,000	.006000	.000500	.....	.....	
11,000	55,000	.006500	.000500	.....	.....	
11,200	56,000	.007250	.000750	.....	.....	
11,400	57,000	.008100	.000850	.....	.....	
11,600	58,000	.008900	.000800	.....	.....	
11,800	59,000	.009600	.000700	.....	.....	
12,000	60,000	.010400	.000800	.....	.....	
12,400	62,000	.011900	.001500	.....	.....	
12,800	64,000	.013500	.001600	.....	.....	
13,200	66,000	.015750	.002250	.....	.....	
13,600	68,000	.017250	.001500	.....	.....	
14,000	70,000	.019000	.001750	.....	.....	
14,400	72,000	.021100	.002100	.....	.....	
14,800	74,000	.023500	.002400	.....	.....	
15,200	76,000	.025750	.002250	.....	.....	
15,600	78,000	.028500	.002750	.....	.....	
16,000	80,000	.031750	.003250	.....	.....	
16,400	82,000	.035000	.003250	.....	.....	
16,800	84,000	.038500	.003500	.....	.....	
17,200	86,000	.042650	.004150	.....	.....	
17,600	88,000	.047500	.004850	.....	.....	
18,000	90,000	.054250	.006750	.....	.....	
18,400	92,000	.062900	.008650	.....	.....	
18,800	94,000	.0800	.0171	.....	.....	
19,200	96,000	.1000	.0200	.....	.....	
19,290	96,450	.1300	.0300	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	96,450
Elastic limit per square inch of original section	do....	48,000
Elongation per inch after rupture	inch..	0.2150
Elongation per inch under strain at elastic limit	do....	.001700
Reduction in diameter at point of rupture	do....	.105
Reduction in area after rupture, per centum of original section		37.1
Position of rupture		1″ from neck
Character of broken surface		silky
Elongation of inch sections		″.16, ″.27*

No. 3409.

Marks, $\frac{32\ \text{Re J}}{\text{T, M}}$
Diameter, ".505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	.....	
2,000	10,000	.000250	.000150	0.	.....	
3,000	15,000	.000450	.000200	0.	.....	
4,000	20,000	.000600	.000150	0.	.....	
5,000	25,000	.000800	.000200	0.	.....	
6,000	30,000	.000900	.000100	0.	.....	
7,000	35,000	.001100	.000200	0.	.....	
8,000	40,000	.001350	.000250	0.	.....	
9,000	45,000	.001500	.000150	.....	.....	
9,200	46,000	.001550	.000050	.....	.....	
9,400	47,000	.001600	.000050	.....	.....	
9,600	48,000	.001650	.000050	.....	.....	Elastic limit.
9,800	49,000	.001900	.000250	.....	.....	
10,000	50,000	.002750	.000850	.....	.....	
10,200	51,000	.003900	.001150	.....	.....	
10,400	52,000	.004900	.001000	.....	.....	
10,600	53,000	.005750	.000850	.....	.....	
10,800	54,000	.006500	.000750	.....	.....	
11,000	55,000	.007250	.000750	.....	.....	
11,200	56,000	.008000	.000750	.....	.....	
11,400	57,000	.008800	.000800	.....	.....	
11,600	58,000	.009500	.000700	.....	.....	
11,800	59,000	.010200	.000700	.....	.....	
12,000	60,000	.011050	.000850	.....	.....	
12,400	62,000	.012500	.001450	.....	.....	
12,800	64,000	.014150	.001650	.....	.....	
13,200	66,000	.015850	.001700	.....	.....	
13,600	68,000	.017850	.002000	.....	.....	
14,000	70,000	.020050	.002200	.....	.....	
14,400	72,000	.022100	.002050	.....	.....	
14,800	74,000	.024900	.002800	.....	.....	
15,200	76,000	.027000	.002100	.....	.....	
15,600	78,000	.029850	.002850	.....	.....	
16,000	80,000	.033250	.003400	.....	.....	
16,400	82,000	.037500	.004250	.....	.....	
16,800	84,000	.042500	.005000	.....	.....	
17,200	86,000	.047100	.004600	.....	.....	
17,600	88,000	.052000	.004900	.....	.....	
18,000	90,000	.059000	.007000	.....	.....	
18,400	92,000	.0650	.0060	.....	.....	
18,800	94,000	.0850	.0200	.....	.....	
19,080	95,400	.1350	.0500	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	95,400
Elastic limit per square inch of original section	do....	48,000
Elongation per inch after rupture	inch..	0.2000
Elongation per inch under strain at elastic limit	do....	.001650
Reduction in diameter at point of rupture	do....	.105
Reduction in area after rupture, per centum of original section		37.1
Position of rupture		".90 from neck
Character of broken surface		silky
Elongation of inch sections		".14, ".26*

No. 3615.

Marks, $\frac{32\ R_{60}\ J}{T_3\ M}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000150	.000150	0.	.....	
2,000	10,000	.000250	.000100	0.	.....	
3,000	15,000	.000450	.000200	0.	.....	
4,000	20,000	.000600	.000150	0.	.....	
5,000	25,000	.000750	.000150	0.	.....	
6,000	30,000	.000950	.000200	0.	.....	
7,000	35,000	.001100	.000150	0.	.....	
8,000	40,000	.001300	.000200	0.	.....	
9,000	45,000	.001450	.000150	.....	.....	
10,000	50,000	.001600	.000150	.....	.....	
10,200	51,000	.001700	.000100	.....	.....	
10,400	52,000	.001750	.000050	.....	.....	
10,600	53,000	.001800	.000050	.....	.....	
10,800	54,000	.001850	.000050	.....	.....	
11,000	55,000	.001950	.000100	.....	.....	Elastic limit.
11,200	56,000	.002300	.000350	.....	.....	
11,400	57,000	.002800	.000500	.....	.....	
11,600	58,000	.003350	.000550	.....	.....	
11,800	59,000	.003900	.000550	.....	.....	
12,000	60,000	.004550	.000650	.....	.....	
12,400	62,000	.006150	.001600	.....	.....	
12,800	64,000	.007800	.001650	.....	.....	
13,200	66,000	.009500	.001700	.....	.....	
13,600	68,000	.011050	.001550	.....	.....	
14,000	70,000	.012650	.001600	.....	.....	
14,400	72,000	.013550	.000900	.....	.....	
14,800	74,000	.015500	.001950	.....	.....	
15,200	76,000	.017000	.001500	.....	.....	
15,600	78,000	.018750	.001750	.....	.....	
16,000	80,000	.021000	.002250	.....	.....	
16,400	82,000	.023250	.002250	.....	.....	
16,800	84,000	.025300	.002050	.....	.....	
17,200	86,000	.027550	.002250	.....	.....	
17,600	88,000	.029650	.002100	.....	.....	
18,000	90,000	.032650	.003000	.....	.....	
18,400	92,000	.035000	.002350	.....	.....	
18,800	94,000	.038050	.003050	.....	.....	
19,200	96,000	.042000	.003950	.....	.....	
19,600	98,000	.047250	.005250	.....	.....	
20,000	100,000	.052750	.005500	.....	.....	
20,400	102,000	.059250	.006500	.....	.....	
20,800	104,000	.0650	.005750	.....	.....	
21,200	106,000	.0850	.0200	.....	.....	
21,410	107,050	.1150	.0300	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	107,050
Elastic limit per square inch of original section	do....	55,000
Elongation per inch after rupture	inch..	0.1850
Elongation per inch under strain at elastic limit	do....	.001950
Reduction in diameter at point of rupture	do....	.095
Reduction in area after rupture, per centum of original section		34.0
Position of rupture		1″.10 from neck
Character of broken surface		granular; silky center
Elongation of inch sections		″.21*, ″.16

No. 3416.

Marks, $\frac{32\ R_{40}\ J}{T_4\ M}$

Diameter, ″.505.

Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	.....	
2,000	10,000	.000300	.000200	0.	.....	
3,000	15,000	.000450	.000150	0.	.....	
4,000	20,000	.000600	.000150	0.	.....	
5,000	25,000	.000800	.000200	0.	.....	
6,000	30,000	.000950	.000150	0.	.....	
7,000	35,000	.001100	.000150	0.	.....	
8,000	40,000	.001300	.000200	0.	.....	
9,000	45,000	.001500	.000200	.....	.....	
10,000	50,000	.001650	.000150	.....	.....	
10,200	51,000	.001700	.000050	.....	.....	
10,400	52,000	.001750	.000050	.....	.....	
10,600	53,000	.001850	.000100	.....	.....	
10,800	54,000	.001950	.000100	.....	.....	Elastic limit.
11,000	55,000	.002200	.000250	.....	.....	
11,200	56,000	.002500	.000300	.....	.....	
11,400	57,000	.003000	.000500	.....	.....	
11,600	58,000	.003500	.000500	.....	.....	
11,800	59,000	.004150	.000650	.....	.....	
12,000	60,000	.004900	.000750	.....	.....	
12,400	62,000	.006500	.001600	.....	.....	
12,800	64,000	.008000	.001500	.....	.....	
13,200	66,000	.009500	.001500	.....	.....	
13,600	68,000	.011100	.001600	.....	.....	
14,000	70,000	.012500	.001400	.....	.....	
14,400	72,000	.014150	.001650	.....	.....	
14,800	74,000	.015850	.001700	.....	.....	
15,200	76,000	.017750	.001900	.....	.....	
15,600	78,000	.020250	.002500	.....	.....	
16,000	80,000	.022350	.002100	.....	.....	
16,400	82,000	.024000	.001650	.....	.....	
16,800	84,000	.026000	.002000	.....	.....	
17,200	86,000	.028400	.002400	.....	.....	
17,600	88,000	.031000	.002600	.....	.....	
18,000	90,000	.034250	.003250	.....	.....	
18,400	92,000	.038100	.003850	.....	.....	
18,800	94,000	.042000	.003900	.....	.....	
19,200	96,000	.046500	.004500	.....	.....	
19,600	98,000	.052000	.005500	.....	.....	
20,000	100,000	.0600	.0080	.....	.....	
20,400	102,000	.0705	.0105	.....	.....	
20,800	104,000	.0850	.0145	.....	.....	
20,890	104,450	.1050	.0200	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds	104,450
Elastic limit, per square inch of original section	do	54,000
Elongation per inch after rupture	inch	0.1900
Elongation per inch under strain at elastic limit	do	.001950
Reduction in diameter at point of rupture	do	.105
Reduction in area after rupture, per centum of original section		37.1
Position of rupture		1″.15 from neck
Character of broken surface		silky; granular at circumference.
Elongation of inch sections		″.21*, ″.17

No. 3502.

Marks, $\frac{32\ Rs\ J}{T_2\ M}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	.....	
2,000	10,000	.000250	.000150	0.	.....	
3,000	15,000	.000450	.000200	0.	.....	
4,000	20,000	.000650	.000200	0.	.....	
5,000	25,000	.000850	.000200	0.	.....	
6,000	30,000	.001000	.000150	0.	.....	
7,000	35,000	.001150	.000150	0.	.....	
8,000	40,000	.001300	.000150	0.	.....	
9,000	45,000	.001450	.000150	.....	.....	
10,000	50,000	.001700	.000250	.....	.....	Elastic limit.
10,200	51,000	.001850	.000150	.....	.....	
10,400	52,000	.002600	.000750	.....	.....	
10,600	53,000	.004000	.001400	.....	.....	
10,800	54,000	.004600	.000600	.....	.....	
11,000	55,000	.005400	.000800	.....	.....	
11,200	56,000	.006250	.000850	.....	.....	
11,400	57,000	.007100	.000850	.....	.....	
11,600	58,000	.008000	.000900	.....	.....	
11,800	59,000	.008600	.000600	.....	.....	
12,000	60,000	.009600	.001000	.....	.....	
12,400	62,000	.011200	.001600	.....	.....	
12,800	64,000	.013000	.001800	.....	.....	
13,200	66,000	.014850	.001850	.....	.....	
13,600	68,000	.016900	.002050	.....	.....	
14,000	70,000	.018900	.002000	.....	.....	
14,400	72,000	.021000	.002100	.....	.....	
14,800	74,000	.023400	.002400	.....	.....	
15,200	76,000	.026050	.002650	.....	.....	
15,600	78,000	.028800	.002750	.....	.....	
16,000	80,000	.032400	.003600	.....	.....	
16,400	82,000	.035250	.002850	.....	.....	
16,800	84,000	.039000	.003750	.....	.....	
17,200	86,000	.043500	.004500	.....	.....	
17,600	88,000	.049000	.005500	.....	.....	
18,000	90,000	.055750	.006750	.....	.....	
18,400	92,000	.0650	.009250	.....	.....	
18,800	94,000	.0850	.0200	.....	.....	
19,200	96,000	.1150	.0300	.....	.....	Tensile strength.
		.1450	.0300	.....	.....	

General summary.

Tensile strength per square inch of original section	pounds..	96,000
Elastic limit per square inch of original section	do....	50,000
Elongation per inch after rupture	inch..	0.1900
Elongation per inch under strain at elastic limit	do....	.001700
Reduction in diameter at point of rupture	do....	.095
Reduction in area after rupture, per centum of original section		34.0
Position of rupture		″.65 from neck

Character of broken surface, granular, 60 per cent.; silky, 40 per cent. Opened cracks in surface of stem.

Elongation of inch sections ″.09, ″.29*

No. 3503.

Marks, $\frac{32\ Rs\ J}{T_4\ M}$
Diameter, ".505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	.....	
2,000	10,000	.000300	.000200	0.	.....	
3,000	15,000	.000500	.000200	0.	.....	
4,000	20,000	.000650	.000150	0.	.....	
5,000	25,000	.000850	.000200	0.	.....	
6,000	30,000	.001000	.000150	0.	.....	
7,000	35,000	.001150	.000150	0.	.....	
8,000	40,000	.001350	.000200	0.	.....	
9,000	45,000	.001500	.000150	.....	.....	
9,200	46,000	.001550	.000050	.....	.....	
9,400	47,000	.001600	.000050	.....	.....	
9,600	48,000	.001650	.000050	.....	.....	
9,800	49,000	.001700	.000050	.....	.....	
10,000	50,000	.001800	.000100	.....	.....	
10,200	51,000	.001900	.000100	.....	.....	Elastic limit.
10,400	52,000	.002100	.000200	.....	.....	
10,600	53,000	.003000	.000900	.....	.....	
10,800	54,000	.003900	.000900	.....	.....	
11,000	55,000	.004750	.000850	.....	.....	
11,200	56,000	.005300	.000550	.....	.....	
11,400	57,000	.005800	.000500	.....	.....	
11,600	58,000	.006350	.000550	.....	.....	
11,800	59,000	.007250	.000900	.....	.....	
12,000	60,000	.008000	.000750	.....	.....	
12,400	62,000	.009850	.001850	.....	.....	
12,800	64,000	.011350	.001500	.....	.....	
13,200	66,000	.013250	.001900	.....	.....	
13,600	68,000	.015050	.001800	.....	.....	
14,000	70,000	.017000	.001950	.....	.....	
14,400	72,000	.018900	.001900	.....	.....	
14,800	74,000	.020750	.001850	.....	.....	
15,200	76,000	.023100	.002350	.....	.....	
15,600	78,000	.025350	.002250	.....	.....	
16,000	80,000	.027900	.002550	.....	.....	
16,400	82,000	.031000	.003100	.....	.....	
16,800	84,000	.034500	.003500	.....	.....	
17,200	86,000	.038000	.003500	.....	.....	
17,600	88,000	.042750	.004750	.....	.....	
18,000	90,000	.047250	.004500	.....	.....	
18,400	92,000	.052500	.005250	.....	.....	
18,800	94,000	.0625	.0100	.....	.....	
19,200	96,000	.0750	.0125	.....	.....	
19,600	98,000	.0950	.0200	.....	.....	
19,710	98,550	.1400	.0450	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	98,550
Elastic limit per square inch of original section	do ..	51,000
Elongation per inch after rupture	inch..	0.1800
Elongation per inch under strain at elastic limit	do ...	.001900
Reduction in diameter at point of rupture	do ...	.075
Reduction in area after rupture, per centum of original section		27.4
Position of rupture		1" from neck

Character of broken surface, granular; dull spot at the circumference. Opened cracks in surface of stem.

Elongation of inch sections ".12, ".24"

No. 3534.

Marks, $\frac{32\ B_{44}\ J}{T_2\ M}$
Diameter, ″505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	.....	
2,000	10,000	.000250	.000150	0.	.....	
3,000	15,000	.000450	.000200	0.	.....	
4,000	20,000	.000650	.000200	0.	.....	
5,000	25,000	.000800	.000150	0.	.....	
6,000	30,000	.000950	.000150	0.	.....	
7,000	35,000	.001100	.000150	0.	.....	
8,000	40,000	.001300	.000200	0.	.....	
9,000	45,000	.001450	.000150	.....	.....	
10,000	50,000	.001600	.000150	.....	.....	
10,200	51,000	.001650	.000050	.....	.....	
10,400	52,000	.001700	.000050	.....	.....	
10,600	53,000	.001750	.000050	.....	.....	
10,800	54,000	.001800	.000050	.....	.....	Elastic limit.
11,000	55,000	.001950	.000150	.....	.....	
11,200	56,000	.002750	.000800	.....	.....	
11,400	57,000	.004000	.001250	.....	.....	
11,600	58,000	.005150	.001150	.....	.....	
11,800	59,000	.006100	.000950	.....	.....	
12,000	60,000	.007350	.001250	.....	.....	
12,400	62,000	.008550	.001200	.....	.....	
12,800	64,000	.009750	.001200	.....	.....	
13,200	66,000	.011500	.001750	.....	.....	
13,600	68,000	.013250	.001750	.....	.....	
14,000	70,000	.014850	.001600	.....	.....	
14,400	72,000	.016800	.001950	.....	.....	
14,800	74,000	.018850	.002050	.....	.....	
15,200	76,000	.020750	.001900	.....	.....	
15,600	78,000	.022600	.001850	.....	.....	
16,000	80,000	.025050	.002450	.....	.....	
16,400	82,000	.027600	.002550	.....	.....	
16,800	84,000	.030550	.002950	.....	.....	
17,200	86,000	.033400	.002850	.....	.....	
17,600	88,000	.036900	.003900	.....	.....	
18,000	90,000	.041150	.004250	.....	.....	
18,400	92,000	.046250	.005100	.....	.....	
18,800	94,000	.052500	.006250	.....	.....	
19,200	96,000	.0625	.0100	.....	.....	
19,600	98,000	.0700	.0075	.....	.....	
20,000	100,000	.0850	.0150	.....	.....	
20,240	101,200	.1250	.0400	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	101,200
Elastic limit per square inch of original section	do....	54,000
Elongation per inch after rupture	inch..	0.2000
Elongation per inch under strain at elastic limit	do....	.001800
Reduction in diameter at point of rupture	do....	.115
Reduction in area after rupture, per centum of original section		40.3
Position of rupture		″.40 from neck
Character of broken surface		silky
Elongation of inch sections		″.28, ″.12

No. 3535.

Marks, $\frac{32\ R_{44}\ J}{T_4\ M}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	.....	
2,000	10,000	.000300	.000200	0.	.....	
3,000	15,000	.000450	.000150	0.	.....	
4,000	20,000	.000600	.000150	0.	.....	
5,000	25,000	.000800	.000200	0.	.....	
6,000	30,000	.000950	.000150	0.	.....	
7,000	35,000	.001100	.000150	0.	.....	
8,000	40,000	.001300	.000200	0.	.....	
9,000	45,000	.001500	.000200	.....	.....	
10,000	50,000	.001650	.000150	.....	.....	
10,200	51,000	.001700	.000050	.....	.....	
10,400	52,000	.001800	.000100	.....	.....	
10,600	53,000	.001850	.000050	.....	.....	
10,800	54,000	.001900	.000050	.....	.....	
11,000	55,000	.001950	.000050	.....	.....	Elastic limit.
11,200	56,000	.002450	.000500	.....	.....	
11,400	57,000	.003500	.001050	.....	.....	
11,600	58,000	.004400	.000200	.....	.....	
11,800	59,000	.005400	.001000	.....	.....	
12,000	60,000	.006200	.000800	.....	.....	
12,400	62,000	.007550	.001350	.....	.....	
12,800	64,000	.009000	.001450	.....	.....	
13,200	66,000	.010900	.001900	.....	.....	
13,600	68,000	.012500	.001600	.....	.....	
14,000	70,000	.014200	.001700	.....	.....	
14,400	72,000	.015900	.001700	.....	.....	
14,800	74,000	.017750	.001850	.....	.....	
15,200	76,000	.020000	.002250	.....	.....	
15,600	78,000	.021750	.001750	.....	.....	
16,000	80,000	.023700	.001950	.....	.....	
16,400	82,000	.026200	.002500	.....	.....	
16,800	84,000	.029100	.002900	.....	.....	
17,200	86,000	.032150	.003050	.....	.....	
17,600	88,000	.035000	.002850	.....	.....	
18,000	90,000	.038900	.003900	.....	.....	
18,400	92,000	.043250	.004350	.....	.....	
18,800	94,000	.048000	.004750	.....	.....	
19,200	96,000	.054600	.006600	.....	.....	
19,600	98,000	.063000	.0084	.....	.....	
20,000	100,000	.0850	.0220	.....	.....	
20,390	101,950	.1150	.0300	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	101,950
Elastic limit per square inch of original section	do....	55,000
Elongation per inch after rupture	inch..	0.1500
Elongation per inch under strain at elastic limit	do....	.001950
Reduction in diameter at point of rupture	do....	.055
Reduction in area after rupture, per centum of original section		20.5
Position of rupture		1″.05 from neck
Character of broken surface, granular; radiating from a dull spot at the circumference. Opened cracks in the surface of stem.		
Elongation of inch sections		″.10, ″.20

No. 3639.

Marks, $\frac{22\ R_{44}\ J}{T_2\ M}$
Diameter, ".505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000150	.000150	0.		
2,000	10,000	.000300	.000150	0.		
3,000	15,000	.000500	.000200	0.		
4,000	20,000	.000650	.000150	0.		
5,000	25,000	.000850	.000200	0.		
6,000	30,000	.001000	.000150	0.		
7,000	35,000	.001150	.000150	0.		
8,000	40,000	.001350	.000200	0.		
9,000	45,000	.001500	.000150			
10,000	50,000	.001650	.000150			
10,200	51,000	.001700	.000050			
10,400	52,000	.001750	.000050			Elastic limit.
10,600	53,000	.001900	.000150			
10,800	54,000	.002900	.001000			
11,000	55,000	.004250	.001350			
11,200	56,000	.005350	.001100			
11,400	57,000	.006500	.001150			
11,600	58,000	.007400	.000900			
11,800	59,000	.008500	.001100			
12,000	60,000	.009250	.000750			
12,400	62,000	.011000	.001750			
12,800	64,000	.013050	.002050			
13,200	66,000	.014900	.001850			
13,600	68,000	.017000	.002100			
14,000	70,000	.019100	.002100			
14,400	72,000	.021350	.002250			
14,800	74,000	.024350	.003000			
15,200	76,000	.027000	.002650			
15,600	78,000	.029600	.002600			
16,000	80,000	.033050	.003450			
16,400	82,000	.037250	.004200			
16,800	84,000	.042500	.005250			
17,200	86,000	.048500	.006000			
17,600	88,000	.053750	.005250			
18,000	90,000	.062800	.009050			
18,400	92,000	.0800	.0172			
18,800	94,000	.1050	.0250			
18,810	94,050	.1350	.0300			Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	94,050
Elastic limit per square inch of original section	do....	52,000
Elongation per inch after rupture	inch..	0.1900
Elongation per inch under strain at elastic limit	do....	.001750
Reduction in diameter at point of rupture	do....	.115
Reduction in area after rupture, per centum of original section		40.3
Position of rupture		".65 from neck
Character of broken surface	silky, 60 per cent.; granular, 40 per cent.	
Elongation of inch sections		".09, ".29"

No. 3640.

Marks, $\frac{32\ Ra\ J}{T_5\ M}$
Diameter, ".505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000150	.000150	0.	.....	
2,000	10,000	.000300	.000150	0.	.....	
3,000	15,000	.000500	.000200	0.	.....	
4,000	20,000	.000650	.000150	0.	.....	
5,000	25,000	.000800	.000150	0.	.....	
6,000	30,000	.001000	.000200	0.	.....	
7,000	35,000	.001150	.000150	0.	.....	
8,000	40,000	.001300	.000150	0.	.....	
9,000	45,000	.001450	.000150	.....	.....	
10,000	50,000	.001650	.000200	.....	.....	
10,200	51,000	.001700	.000050	.....	.....	
10,400	52,000	.001800	.000100	.....	.....	Elastic limit.
10,600	53,000	.002000	.000200	.....	.....	
10,800	54,000	.004000	.002000	.....	.....	
11,000	55,000	.005500	.001500	.....	.....	
11,200	56,000	.006500	.001000	.....	.....	
11,400	57,000	.007500	.001000	.....	.....	
11,600	58,000	.008250	.000750	.....	.....	
11,800	59,000	.009000	.000750	.....	.....	
12,000	60,000	.010000	.001000	.....	.....	
12,400	62,000	.012250	.002250	.....	.....	
12,800	64,000	.014200	.001950	.....	.....	
13,200	66,000	.016050	.001850	.....	.....	
13,600	68,000	.017850	.001800	.....	.....	
14,000	70,000	.020000	.002150	.....	.....	
14,400	72,000	.022000	.002000	.....	.....	
14,800	74,000	.024300	.002300	.....	.....	
15,200	76,000	.027350	.003050	.....	.....	
15,600	78,000	.030600	.003250	.....	.....	
16,000	80,000	.033600	.003000	.....	.....	
16,400	82,000	.037500	.003900	.....	.....	
16,800	84,000	.041100	.003600	.....	.....	
17,200	86,000	.047250	.006150	.....	.....	
17,600	88,000	.053750	.006500	.....	.....	
18,000	90,000	.059500	.005750	.....	.....	
18,400	92,000	.074750	.015250	.....	.....	
18,800	94,000	.1000	.025250	.....	.....	
19,010	95,050	.1550	.0550	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	95,050
Elastic limit per square inch of original section	do ...	52,000
Elongation per inch after rupture	inch..	0.1700
Elongation per inch under strain at elastic limit	do....	.001800
Reduction in diameter at point of rupture	do....	.075
Reduction in area after rupture, per centum of original section	.....	27.4
Position of rupture		".80 from neck
Character of broken surface		granular; dull flaky eccentric spot
Elongation of inch sections		".13, ".21*

No. 3565.

Marks, $\frac{22\ R_{22}\ J}{T_2\ M}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000150	.000150	0.		
2,000	10,000	.000350	.000200	0.		
3,000	15,000	.000500	.000150	0.		
4,000	20,000	.000700	.000200	0.		
5,000	25,000	.000850	.000150	0.		
6,000	30,000	.001000	.000150	0.		
7,000	35,000	.001200	.000200	0.		
8,000	40,000	.001350	.000150	0.		
9,000	45,000	.001550	.000200			
9,600	48,000	.001700	.000150			
9,800	49,000	.001750	.000050			
10,000	50,000	.001800	.000050			
10,200	51,000	.001850	.000050			
10,400	52,000	.001850	0.			
10,600	53,000	.001900	.000050			
10,800	54,000	.002000	.000100			
11,000	55,000	.002150	.000150			Elastic limit.
11,200	56,000	.002500	.000350			
11,400	57,000	.003600	.001100			
11,600	58,000	.004500	.000900			
11,800	59,000	.005100	.000600			
12,000	60,000	.005900	.000800			
12,400	62,000	.007500	.001600			
12,800	64,000	.009000	.001500			
13,200	66,000	.010500	.001500			
13,600	68,000	.012150	.001650			
14,000	70,000	.014100	.001950			
14,400	72,000	.016000	.001900			
14,800	74,000	.017450	.001450			
15,200	76,000	.019250	.001800			
15,600	78,000	.021150	.001900			
16,000	80,000	.023400	.002250			
16,400	82,000	.025900	.002500			
16,800	84,000	.028100	.002200			
17,200	86,000	.030800	.002700			
17,600	88,000	.034000	.003200			
18,000	90,000	.037750	.003750			
18,400	92,000	.042000	.004250			
18,800	94,000	.046500	.004500			
19,200	96,000	.0525	.0060			
19,600	98,000	.0600	.0075			
20,000	100,000	.0675	.0075			
20,400	102,000	.0950	.0275			
20,510	102,550	.1200	.0250			Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	102,550
Elastic limit per square inch of original section	do ...	55,000
Elongation per inch after rupture	inch..	0.2000
Elongation per inch under strain at elastic limit	do....	.002150
Reduction in diameter at point of rupture	do....	.115
Reduction in area after rupture, per centum of original section		40.3
Position of rupture		1″ from neck
Character of broken surface		silky
Elongation of inch sections		″.27*, ″.13

No. 3566.

Marks, $\frac{32\ Res\ J}{T_4\ M}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	.....	
2,000	10,000	.000300	.000200	0.	.....	
3,000	15,000	.000450	.000150	0.	.....	
4,000	20,000	.000650	.000200	0.	.....	
5,000	25,000	.000800	.000150	0.	.....	
6,000	30,000	.001000	.000200	0.	.....	
7,000	35,000	.001150	.000150	0.	.....	
8,000	40,000	.001350	.000200	0.	.....	
9,000	45,000	.001500	.000150	.....	.....	
10,000	50,000	.001750	.000250	.....	.....	
10,200	51,000	.001800	.000050	.....	.....	
10,400	52,000	.001850	.000050	.....	.....	
10,600	53,000	.001900	.000050	.....	.....	
10,800	54,000	.001950	.000050	.....	.....	
11,000	55,000	.002000	.000050	.....	.....	Elastic limit.
11,200	56,000	.002150	.000150	.....	.....	
11,400	57,000	.002400	.000250	.....	.....	
11,600	58,000	.002700	.000300	.....	.....	
11,800	59,000	.003500	.000800	.....	.....	
12,000	60,000	.004350	.000850	.....	.....	
12,400	62,000	.006050	.001700	.....	.....	
12,800	64,000	.007900	.001850	.....	.....	
13,200	66,000	.009000	.001100	.....	.....	
13,600	68,000	.010950	.001950	.....	.....	
14,000	70,000	.012600	.001650	.....	.....	
14,400	72,000	.014350	.001750	.....	.....	
14,800	74,000	.015950	.001600	.....	.....	
15,200	76,000	.017750	.001800	.....	.....	
15,600	78,000	.019600	.001850	.....	.....	
16,000	80,000	.021600	.002000	.....	.....	
16,400	82,000	.024000	.002400	.....	.....	
16,800	84,000	.026100	.002100	.....	.....	
17,200	86,000	.028500	.002400	.....	.....	
17,600	88,000	.031400	.002900	.....	.....	
18,000	90,000	.034750	.003350	.....	.....	
18,400	92,000	.038500	.003750	.....	.....	
18,800	94,000	.042350	.003850	.....	.....	
19,200	96,000	.047600	.005250	.....	.....	
19,600	98,000	.053750	.006150	.....	.....	
20,000	100,000	.0625	.008750	.....	.....	
20,400	102,000	.0800	.0175	.....	.....	
20,640	103,200	.1100	.0300	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	103,200
Elastic limit per square inch of original section	do ...	55,000
Elongation per inch after rupture	inch..	0.1950
Elongation per inch under strain at elastic limit	do....	.002000
Reduction in diameter at point of rupture	do....	.105
Reduction in area after rupture, per centum of original section		37.1
Position of rupture		″.70 from neck
Character of broken surface		silky
Elongation of inch sections		″.28″, ″.11

No. 3504.

Marks, $\frac{82\ R\ J}{T_2\ M}$
Diameter, ".505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000150	.000150	0.	.....	
2,000	10,000	.000300	.000150	0.	.....	
3,000	15,000	.000450	.000150	0.	.....	
4,000	20,000	.000650	.000200	0.	.....	
5,000	25,000	.000800	.000150	0.	.....	
6,000	30,000	.000950	.000150	0.	.....	
7,000	35,000	.001150	.000200	0.	.....	
8,000	40,000	.001350	.000200	0.	.....	
9,000	45,000	.001500	.000150	.....	.....	
10,000	50,000	.001750	.000250	.....	.....	
10,200	51,000	.001800	.000050	.....	.....	
10,400	52,000	.001850	.000050	.....	.....	
10,600	53,000	.001900	.000050	.....	.....	
10,800	54,000	.002000	.000100	.....	.....	Elastic limit.
11,000	55,000	.002250	.000250	.....	.....	
11,200	56,000	.002700	.000450	.....	.....	
11,400	57,000	.003350	.000650	.....	.....	
11,600	58,000	.004000	.000650	.....	.....	
11,800	59,000	.005000	.001000	.....	.....	
12,000	60,000	.005950	.000950	.....	.....	
12,400	62,000	.007400	.001450	.....	.....	
12,800	64,000	.009000	.001600	.....	.....	
13,200	66,000	.010750	.001750	.....	.....	
13,600	68,000	.012400	.001650	.....	.....	
14,000	70,000	.014000	.001600	.....	.....	
14,400	72,000	.015750	.001750	.....	.....	
14,800	74,000	.017750	.002000	.....	.....	
15,200	76,000	.020000	.002250	.....	.....	
15,600	78,000	.022100	.002100	.....	.....	
16,000	80,000	.024250	.002150	.....	.....	
16,400	82,000	.026750	.002500	.....	.....	
16,800	84,000	.029200	.002450	.....	.....	
17,200	86,000	.032350	.003150	.....	.....	
17,600	88,000	.035650	.003300	.....	.....	
18,000	90,000	.039250	.003600	.....	.....	
18,400	92,000	.044500	.005250	.....	.....	
18,800	94,000	.049500	.005000	.....	.....	
19,200	96,000	.057000	.007500	.....	.....	
19,600	98,000	.0650	.0080	.....	.....	
20,000	100,000	.0850	.0200	.....	.....	
20,270	101,350	.1250	.0400	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	101,350
Elastic limit per square inch of original section	do....	54,000
Elongation per inch after rupture	inch..	0.2000
Elongation per inch under strain at elastic limit	do	.002000
Reduction in diameter at point of rupture	do....	.105
Reduction in area after rupture, per centum of original section		37.1
Position of rupture		1" from neck
Character of broken surface		silky, interspersed with granulation
Elongation of inch sections		".14, ".26*

No. 3566.

Marks, $\frac{32\ Res\ J}{T_4\ M}$
Diameter, ".505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	.....	
2,000	10,000	.000300	.000200	0.	.....	
3,000	15,000	.000450	.000150	0.	.....	
4,000	20,000	.000650	.000200	0.	.....	
5,000	25,000	.000800	.000150	0.	.....	
6,000	30,000	.001000	.000200	0.	.....	
7,000	35,000	.001150	.000150	0.	.....	
8,000	40,000	.001350	.000200	0.	.....	
9,000	45,000	.001500	.000150	.....	.....	
10,000	50,000	.001750	.000250	.....	.....	
10,200	51,000	.001800	.000050	.....	.....	
10,400	52,000	.001850	.000050	.....	.....	
10,600	53,000	.001900	.000050	.....	.....	
10,800	54,000	.001950	.000050	.....	.....	
11,000	55,000	.002000	.000050	.....	.....	Elastic limit.
11,200	56,000	.002150	.000150	.....	.....	
11,400	57,000	.002400	.000250	.....	.....	
11,600	58,000	.002700	.000300	.....	.....	
11,800	59,000	.003500	.000800	.....	.....	
12,000	60,000	.004350	.000850	.....	.....	
12,400	62,000	.006050	.001700	.....	.....	
12,800	64,000	.007900	.001850	.....	.....	
13,200	66,000	.009000	.001100	.....	.....	
13,600	68,000	.010950	.001950	.....	.....	
14,000	70,000	.012600	.001650	.....	.....	
14,400	72,000	.014350	.001750	.....	.....	
14,800	74,000	.015950	.001600	.....	.....	
15,200	76,000	.017750	.001800	.....	.....	
15,600	78,000	.019600	.001850	.....	.....	
16,000	80,000	.021600	.002000	.....	.....	
16,400	82,000	.024000	.002400	.....	.....	
16,800	84,000	.026100	.002100	.....	.....	
17,200	86,000	.028500	.002400	.....	.....	
17,600	88,000	.031400	.002900	.....	.....	
18,000	90,000	.034750	.003350	.....	.....	
18,400	92,000	.038500	.003750	.....	.....	
18,800	94,000	.042350	.003850	.....	.....	
19,200	96,000	.047600	.005250	.....	.....	
19,600	98,000	.053750	.006150	.....	.....	
20,000	100,000	.0625	.008750	.....	.....	
20,400	102,000	.0800	.0175	.....	.....	
20,640	103,200	.1100	.0300	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	103,200
Elastic limit per square inch of original section	do ...	55,000
Elongation per inch after rupture	inch..	0.1950
Elongation per inch under strain at elastic limit	do....	.002000
Reduction in diameter at point of rupture	do....	.105
Reduction in area after rupture, per centum of original section		37.1
Position of rupture		".70 from neck
Character of broken surface		silky
Elongation of inch sections		".28", ".11

No. 3504.

Marks, $\frac{32\ R_{27}\ J}{T_3\ M}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000150	.000150	0.	.....	
2,000	10,000	.000300	.000150	0.	.....	
3,000	15,000	.000450	.000150	0.	.....	
4,000	20,000	.000650	.000200	0.	.....	
5,000	25,000	.000800	.000150	0.	.....	
6,000	30,000	.000950	.000150	0.	.....	
7,000	35,000	.001150	.000200	0.	.....	
8,000	40,000	.001350	.000200	0.	.....	
9,000	45,000	.001500	.000150	.....	.....	
10,000	50,000	.001750	.000250	.....	.....	
10,200	51,000	.001800	.000050	.....	.....	
10,400	52,000	.001850	.000050	.....	.....	
10,600	53,000	.001900	.000050	.....	.....	
10,800	54,000	.002000	.000100	.....	.....	Elastic limit.
11,000	55,000	.002250	.000250	.....	.....	
11,200	56,000	.002700	.000450	.....	.....	
11,400	57,000	.003350	.000650	.....	.....	
11,600	58,000	.004000	.000650	.....	.....	
11,800	59,000	.005000	.001000	.....	.....	
12,000	60,000	.005950	.000950	.....	.....	
12,400	62,000	.007400	.001450	.....	.....	
12,800	64,000	.009000	.001600	.....	.....	
13,200	66,000	.010750	.001750	.....	.....	
13,600	68,000	.012400	.001650	.....	.....	
14,000	70,000	.014000	.001600	.....	.....	
14,400	72,000	.015750	.001750	.....	.....	
14,800	74,000	.017750	.002000	.....	.....	
15,200	76,000	.020000	.002250	.....	.....	
15,600	78,000	.022100	.002100	.....	.....	
16,000	80,000	.024250	.002150	.....	.....	
16,400	82,000	.026750	.002500	.....	.....	
16,800	84,000	.029200	.002450	.....	.....	
17,200	86,000	.032350	.003150	.....	.....	
17,600	88,000	.035650	.003300	.....	.....	
18,000	90,000	.039250	.003600	.....	.....	
18,400	92,000	.044500	.005250	.....	.....	
18,800	94,000	.049500	.005000	.....	.....	
19,200	96,000	.057000	.007500	.....	.....	
19,600	98,000	.0650	.0080	.....	.....	
20,000	100,000	.0850	.0200	.....	.....	
20,270	101,350	.1250	.0400	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	101,350
Elastic limit per square inch of original section	do....	54,000
Elongation per inch after rupture	inch..	0.2000
Elongation per inch under strain at elastic limit	do....	.002000
Reduction in diameter at point of rupture	do....	.105
Reduction in area after rupture, per centum of original section		37.1
Position of rupture		1″ from neck
Character of broken surface		silky, interspersed with granulation
Elongation of inch sections		″.14, ″.26*

No. 3505.

Marks, $\frac{82\ R_2\ J}{T_4\ M}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	.....	
2,000	10,000	.000250	.000150	0.	.....	
3,000	15,000	.000450	.000200	0.	.....	
4,000	20,000	.000600	.000150	0.	.....	
5,000	25,000	.000750	.000150	0.	.....	
6,000	30,000	.000950	.000200	0.	.....	
7,000	35,000	.001100	.000150	0.	.....	
8,000	40,000	.001250	.000150	0.	.....	
9,000	45,000	.001450	.000200	.....	.....	
10,000	50,000	.001600	.000150	.....	.....	
10,200	51,000	.001650	.000050	.....	.....	Elastic limit.
10,400	52,000	.001850	.000200	.....	.....	
10,600	53,000	.002000	.000150	.....	.....	
10,800	54,000	.002250	.000250	.....	.....	
11,000	55,000	.002600	.000350	.....	.....	
11,200	56,000	.003150	.000550	.....	.....	
11,400	57,000	.004100	.000950	.....	.....	
11,600	58,000	.004900	.000800	.....	.....	
11,800	59,000	.005650	.000750	.....	.....	
12,000	60,000	.006500	.000850	.....	.....	
12,400	62,000	.008050	.001550	.....	.....	
12,800	64,000	.009750	.001700	.....	.....	
13,200	66,000	.011500	.001750	.....	.....	
13,600	68,000	.013250	.001750	.....	.....	
14,000	70,000	.015100	.001850	.....	.....	
14,400	72,000	.017000	.001900	.....	.....	
14,800	74,000	.019100	.002100	.....	.....	
15,200	76,000	.021100	.002000	.....	.....	
15,600	78,000	.023400	.002300	.....	.....	
16,000	80,000	.025900	.002500	.....	.....	
16,400	82,000	.028500	.002600	.....	.....	
16,800	84,000	.031750	.003250	.....	.....	
17,200	86,000	.035050	.003300	.....	.....	
17,600	88,000	.038500	.003450	.....	.....	
18,000	90,000	.043400	.004900	.....	.....	
18,400	92,000	.048500	.005100	.....	.....	
18,800	94,000	.0550	.0065	.....	.....	
19,200	96,000	.0625	.0075	.....	.....	
19,600	98,000	.0800	.0175	.....	.....	
19,960	99,800	.1150	.0350	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	99,800
Elastic limit per square inch of original section	do....	51,000
Elongation per inch after rupture	inch..	0.2000
Elongation per inch under strain at elastic limit	do....	.001650
Reduction in diameter at point of rupture	do....	.105
Reduction in area after rupture, per centum of original section		37.1
Position of rupture		1″ from neck
Character of broken surface		silky; trace of granulation
Elongation of inch sections		″.24, ″.16

No. 3529.

Marks, $\frac{32\,R_{43}\,J}{T_3\,M}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	.....	
2,000	10,000	.000300	.000200	0.	.....	
3,000	15,000	.000450	.000150	0.	.....	
4,000	20,000	.000600	.000150	0.	.....	
5,000	25,000	.000800	.000200	0.	.....	
6,000	30,000	.001000	.000200	0.	.....	
7,000	35,000	.001150	.000150	0.	.....	
8,000	40,000	.001300	.000150	0.	.....	
9,000	45,000	.001450	.000150	.....	.....	
10,000	50,000	.001650	.000200	.....	.....	
10,200	51,000	.001650	0.	.....	.....	Elastic limit.
10,400	52,000	.002000	.000350	.....	.....	
10,600	53,000	.003750	.001750	.....	.....	
10,800	54,000	.004500	.000750	.....	.....	
11,000	55,000	.005050	.000550	.....	.....	
11,200	56,000	.005850	.000800	.....	.....	
11,400	57,000	.006500	.000650	.....	.....	
11,600	58,000	.007200	.000700	.....	.....	
11,800	59,000	.007950	.000750	.....	.....	
12,000	60,000	.008600	.000650	.....	.....	
12,400	62,000	.010350	.001750	.....	.....	
12,800	64,000	.012000	.001650	.....	.....	
13,200	66,000	.013500	.001500	.....	.....	
13,600	68,000	.015250	.001750	.....	.....	
14,000	70,000	.017100	.001850	.....	.....	
14,400	72,000	.019250	.002150	.....	.....	
14,800	74,000	.021100	.001850	.....	.....	
15,200	76,000	.023050	.001950	.....	.....	
15,600	78,000	.025300	.002250	.....	.....	
16,000	80,000	.027900	.002600	.....	.....	
16,400	82,000	.031000	.003100	.....	.....	
16,800	84,000	.033750	.002750	.....	.....	
17,200	86,000	.037350	003600	.....	.....	
17,600	88,000	.040900	.003550	.....	.....	
18,000	90,000	.045950	.005050	.....	.....	
18,400	92,000	.052250	.006300	.....	.....	
18,800	94,000	.059050	.006800	.....	.....	
19,200	96,000	.0650	.005950	.....	.....	
19,600	98,000	.0850	.0200	.....	.....	
19,920	99,600	.1350	.0500	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	99,600
Elastic limit per square inch of original section	do....	51,000
Elongation per inch after rupture	inch..	0.2200
Elongation per inch under strain at elastic limit	do....	.001650
Reduction in diameter at point of rupture	do....	.115
Reduction in area after rupture, per centum of original section		40.3
Position of rupture		1″ from neck
Character of broken surface		silky
Elongation of inch sections		″.27*, ″.17

No. 3530.

Marks, $\frac{32\ Rs\ J}{T_4\ M}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	.....	
2,000	10,000	.000300	.000200	0.	.....	
3,000	15,000	.000450	.000150	0.	.....	
4,000	20,000	.000600	.000150	0.	.....	
5,000	25,000	.000800	.000200	0.	.....	
6,000	30,000	.001000	.000200	0.	.....	
7,000	35,000	.001150	.000150	0.	.....	
8,000	40,000	.001300	.000150	0.	.....	
9,000	45,000	.001500	.000200	.....	.....	
10,000	50,000	.001650	.000150	.....	.....	
10,200	51,000	.001650	0.	.....	.....	
10,400	52,000	.001700	.000050	.....	.....	
10,600	53,000	.001750	.000050	.....	.....	
10,800	54,000	.001850	.000100	.....	.....	
11,000	55,000	.001900	.000050	.....	.....	
11,200	56,000	.002000	.000100	.....	.....	Elastic limit.
11,400	57,000	.003300	.001300	.....	.....	
11,600	58,000	.004400	.001100	.....	.....	
11,800	59,000	.005400	.001000	.....	.....	
12,000	60,000	.006350	.000950	.....	.....	
12,400	62,000	.008050	.001700	.....	.....	
12,800	64,000	.009750	.001700	.....	.....	
13,200	66,000	.011400	.001650	.....	.....	
13,600	68,000	.013050	.001650	.....	.....	
14,000	70,000	.014750	.001700	.....	.....	
14,400	72,000	.016800	.002050	.....	.....	
14,800	74,000	.019000	.002200	.....	.....	
15,200	76,000	.021800	.002800	.....	.....	
15,600	78,000	.023900	.002100	.....	.....	
16,000	80,000	.027000	.003100	.....	.....	
16,400	82,000	.029350	.002350	.....	.....	
16,800	84,000	.031750	.002400	.....	.....	
17,200	86,000	.034900	.003150	.....	.....	
17,600	88,000	.037900	.003000	.....	.....	
18,000	90,000	.041600	.003700	.....	.....	
18,400	92,000	.046600	.005000	.....	.....	
18,800	94,000	.053000	.006400	.....	.....	
19,200	96,000	.061500	.008500	.....	.....	
19,600	98,000	.073500	.012000	.....	.....	
20,000	100,000	.0950	.0215	.....	.....	
20,120	100,600	.1150	.0200	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	100,600
Elastic limit per square inch of original section	do ...	56,000
Elongation per inch after rupture	inch..	0.2050
Elongation per inch under strain at elastic limit	do....	.002000
Reduction in diameter at point of rupture	do....	.115
Reduction in area after rupture, per centum of original section		40.2
Position of rupture		″.70 from neck
Character of broken surface		silky
Elongation of inch sections		″.10, ″.31*

No. 3588.

Marks, $\frac{32\ Rs\ J}{T_3\ M}$
Diameter, ".505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000150	.000150	0.	.....	
2,000	10,000	.000300	.000150	0.	.....	
3,000	15,000	.000500	.000200	0.	.....	
4,000	20,000	.000650	.000150	0.	.....	
5,000	25,000	.000800	.000150	0.	.....	
6,000	30,000	.000950	.000150	0.	.....	
7,000	35,000	.001150	.000200	0.	.....	
8,000	40,000	.001300	.000150	.000050	.000050	
9,000	45,000	.001450	.000150	.....	.....	
9,600	48,000	.001600	.000150	.....	.....	
9,800	49,000	.001650	.000050	.....	.....	Elastic limit.
10,000	50,000	.001850	.000200	.....	.....	
10,200	51,000	.004000	.002150	.....	.....	
10,400	52,000	.004950	.000950	.....	.....	
10,600	53,000	.006000	.001050	.....	.....	
10,800	54,000	.006800	.000800	.....	.....	
11,000	55,000	.007450	.000650	.....	.....	
11,200	56,000	.008500	.001050	.....	.....	
11,400	57,000	.009500	.001000	.....	.....	
11,600	58,000	.010500	.001000	.....	.....	
11,800	59,000	.011550	.001050	.....	.....	
12,000	60,000	.012550	.001000	.....	.....	
12,400	62,000	.014100	.001550	.....	.....	
12,800	64,000	.016400	.002300	.....	.....	
13,200	66,000	.019000	.002600	.....	.....	
13,600	68,000	.021600	.002600	.....	.....	
14,000	70,000	.024250	.002650	.....	.....	
14,400	72,000	.026500	.002250	.....	.....	
14,800	74,000	.029500	.003000	.....	.....	
15,200	76,000	.032750	.003250	.....	.....	
15,600	78,000	.036250	.003500	.....	.....	
16,000	80,000	.039750	.003500	.....	.....	
16,400	82,000	.044200	.004450	.....	.....	
16,800	84,000	.050500	.006300	.....	.....	
17,200	86,000	.057750	.007250	.....	.....	
17,600	88,000	.0700	.012250	.....	.....	
18,000	90,000	.0900	.0200	.....	.....	
18,360	91,800	.1350	.0450	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	91,800
Elastic limit per square inch of original section	do....	49,000
Elongation per inch after rupture	inch..	0.2350
Elongation per inch under strain at elastic limit	do....	.001650
Reduction in diameter at point of rupture	do....	.135
Reduction in area after rupture, per centum of original section		46.2
Position of rupture		".80 from neck
Character of broken surface		silky
Elongation of inch sections		".33*, ".14

No. 3589.

Marks, $\frac{32\ \text{Res J}}{\text{T}_4\ \text{M}}$
Diameter, ".505.
Sectional area, .20 square inch.

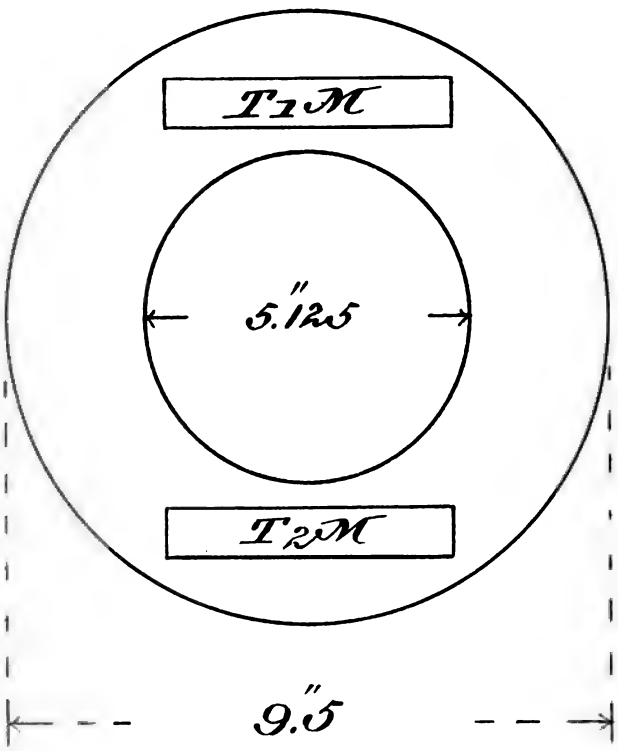
Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	.....	
2,000	10,000	.000300	.000200	0.	.....	
3,000	15,000	.000450	.000150	0.	.....	
4,000	20,000	.000600	.000150	0.	.....	
5,000	25,000	.000800	.000200	0.	.....	
6,000	30,000	.001000	.000200	0.	.....	
7,000	35,000	.001150	.000150	0.	.....	
8,000	40,000	.001300	.000150	.000050	.000050	
9,000	45,000	.001450	.000150	.....	.....	
9,200	46,000	.001500	.000050	.....	.....	
9,400	47,000	.001550	.000050	.....	.....	
9,600	48,000	.001600	.000050	.....	.....	
9,800	49,000	.001650	.000050	.....	.....	Elastic limit.
10,000	50,000	.002600	.000950	.....	.....	
10,200	51,000	.004100	.001500	.....	.....	
10,400	52,000	.005150	.001050	.....	.....	
10,600	53,000	.006050	.000900	.....	.....	
10,800	54,000	.006850	.000800	.....	.....	
11,000	55,000	.007650	.000800	.....	.....	
11,200	56,000	.008600	.000950	.....	.....	
11,400	57,000	.009550	.000950	.....	.....	
11,600	58,000	.010300	.000750	.....	.....	
11,800	59,000	.011100	.000800	.....	.....	
12,000	60,000	.012000	.000900	.....	.....	
12,400	62,000	.013900	.001900	.....	.....	
12,800	64,000	.015850	.001950	.....	.....	
13,200	66,000	.018000	.002150	.....	.....	
13,600	68,000	.020350	.002350	.....	.....	
14,000	70,000	.022750	.002400	.....	.....	
14,400	72,000	.025750	.003000	.....	.....	
14,800	74,000	.028750	.003000	.....	.....	
15,200	76,000	.031750	.003000	.....	.....	
15,600	78,000	.035100	.003350	.....	.....	
16,000	80,000	.039300	.004200	.....	.....	
16,400	82,000	.044500	.005200	.....	.....	
16,800	84,000	.050500	.006000	.....	.....	
17,200	86,000	.058250	.007750	.....	.....	
17,600	88,000	.068750	.010500	.....	.....	
18,000	90,000	.0850	.016250	.....	.....	
18,280	91,400	.1300	.0450	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	91,400
Elastic limit per square inch of original section	do....	49,000
Elongation per inch after rupture	inch..	0.2100
Elongation per inch under strain at elastic limit	do....	.001650
Reduction in diameter at point of rupture	do....	.135
Reduction in area after rupture, per centum of original section		46.2
Position of rupture		".80 from neck
Character of broken surface		silky
Elongation of inch sections		".32*, ".10

3.2 inch Steel B.L. Rifles.

Trunnion Hoops.



H Ex 45 50 2

TRUNNION HOOPS—3.2-INCH B. L. RIFLES.

No. 3574.

Marks, $\frac{32\ R_{ev}\ T\ H}{T_2\ M}$
Diameter, ".505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	.....	
2,000	10,000	.000250	.000150	0.	.....	
3,000	15,000	.000400	.000150	0.	.....	
4,000	20,000	.000550	.000150	0.	.....	
5,000	25,000	.000750	.000200	0.	.....	
6,000	30,000	.000900	.000150	0.	.....	
7,000	35,000	.001050	.000150	0.	.....	
8,000	40,000	.001200	.000150	0.	.....	
9,000	45,000	.001350	.000150	.....	.....	
10,000	50,000	.001500	.000150	.....	.....	
10,200	51,000	.001550	.000050	.....	.....	
10,400	52,000	.001600	.000050	.....	.....	
10,600	53,000	.001650	.000050	.....	.....	
10,800	54,000	.001750	.000100	.....	.....	Elastic limit.
11,000	55,000	.002100	.000350	.....	.....	
11,200	56,000	.002350	.000250	.....	.....	
11,400	57,000	.004000	.001650	.....	.....	
11,600	58,000	.005000	.001000	.....	.....	
11,800	59,000	.006250	.001250	.....	.....	
12,000	60,000	.007700	.001450	.....	.....	
12,400	62,000	.008900	.001200	.....	.....	
12,800	64,000	.010350	.001450	.....	.....	
13,200	66,000	.012050	.001700	.....	.....	
13,600	68,000	.014000	.001950	.....	.....	
14,000	70,000	.016050	.002050	.....	.....	
14,400	72,000	.018050	.002000	.....	.....	
14,800	74,000	.019900	.001850	.....	.....	
15,200	76,000	.022250	.002350	.....	.....	
15,600	78,000	.024750	.002500	.....	.....	
16,000	80,000	.027800	.003050	.....	.....	
16,400	82,000	.030750	.002950	.....	.....	
16,800	84,000	.033500	.002750	.....	.....	
17,200	86,000	.036900	.003400	.....	.....	
17,600	88,000	.041250	.004300	.....	.....	
18,000	90,000	.046500	.005250	.....	.....	
18,400	92,000	.053000	.006500	.....	.....	
18,800	94,000	.061250	.008250	.....	.....	
19,200	96,000	.0750	.013750	.....	.....	
19,600	98,000	.1000	.0250	.....	.....	
19,690	98,450	.1150	.0150	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	98,450
Elastic limit per square inch of original section	do....	54,000
Elongation per inch after rupture	inch..	0.2250
Elongation per inch under strain at elastic limit	do ...	.001750
Reduction in diameter at point of rupture	do ...	.105
Reduction in area after rupture, per centum of original section		37.1
Position of rupture		".95 from neck
Character of broken surface		silky
Elongation of inch sections		".17, ".28"

No. 3575.

Marks, $\frac{32\ \text{Rw}\ \text{T}\ \text{H}}{\text{T}_4\ \text{M}}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000150	.000150	0.	.....	
2,000	10,000	.000300	.000150	0.	.....	
3,000	15,000	.000450	.000150	0.	.....	
4,000	20,000	.000650	.000200	0.	.....	
5,000	25,000	.000800	.000150	0.	.....	
6,000	30,000	.000950	.000150	0.	.....	
7,000	35,000	.001150	.000200	0.	.....	
8,000	40,000	.001300	.000150	0.	.....	
9,000	45,000	.001450	.000150	.....	.....	
10,000	50,000	.001650	.000200	.....	.....	
10,200	51,000	.001700	.000050	.....	.....	
10,400	52,000	.001750	.000050	.....	.....	
10,600	53,000	.001850	.000100	.....	.....	
10,800	54,000	.001900	.000050	.....	.....	Elastic limit.
11,000	55,000	.002100	.000200	.....	.....	
11,200	56,000	.003000	.000900	.....	.....	
11,400	57,000	.004500	.001500	.....	.....	
11,600	58,000	.005500	.001000	.....	.....	
11,800	59,000	.006750	.001250	.....	.....	
12,000	60,000	.008000	.001250	.....	.....	
12,400	62,000	.009250	.001250	.....	.....	
12,800	64,000	.010850	.001600	.....	.....	
13,200	66,000	.012600	.001750	.....	.....	
13,600	68,000	.014350	.001750	.....	.....	
14,000	70,000	.016000	.001650	.....	.....	
14,400	72,000	.018050	.002050	.....	.....	
14,800	74,000	.020250	.002200	.....	.....	
15,200	76,000	.022800	.002550	.....	.....	
15,600	78,000	.025300	.002500	.....	.....	
16,000	80,000	.028250	.002950	.....	.....	
16,400	82,000	.031100	.002850	.....	.....	
16,800	84,000	.034000	.002900	.....	.....	
17,200	86,000	.037350	.003350	.....	.....	
17,600	88,000	.041500	.004150	.....	.....	
18,000	90,000	.046900	.005400	.....	.....	
18,400	92,000	.053250	.006350	.....	.....	
18,800	94,000	.062250	.009000	.....	.....	
19,200	96,000	.0750	.012750	.....	.....	
19,600	98,000	.1000	.0250	.....	.....	
19,680	98,400	.1250	.0250	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	98,400
Elastic limit per square inch of original section	do....	54,000
Elongation per inch after rupture	inch..	0.2450
Elongation per inch under strain at elastic limit	do....	.001900
Reduction in diameter at point of rupture	do....	.115
Reduction in area after rupture, per centum of original section		40.3
Position of rupture		1″ from neck
Character of broken surface		silky
Elongation of inch sections		″.17, ″.32*

No. 3420.

Marks, $\frac{32\ R_{20}\ T\ H}{T_1\ M}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000150	.000150	0.	.....	
2,000	10,000	.000350	.000200	0.	.....	
3,000	15,000	.000500	.000150	0.	.....	
4,000	20,000	.000700	.000200	0.	.....	
5,000	25,000	.000850	.000150	0.	.....	
6,000	30,000	.001000	.000150	0.	.....	
7,000	35,000	.001150	.000150	0.	.....	
8,000	40,000	.001350	.000200	0.	.....	
9,000	45,000	.001500	.000150	.....	.....	
10,000	50,000	.001650	.000150	.....	.....	
10,200	51,000	.001700	.000050	.....	.....	
10,400	52,000	.001750	.000050	.....	.....	
10,600	53,000	.001750	0.	.....	.....	
10,800	54,000	.001800	.000050	.....	.....	
11,000	55,000	.001850	.000050	.....	.....	
11,200	56,000	.001850	0.	.....	.....	
11,400	57,000	.001900	.000050	.....	.....	
11,600	58,000	.002000	.000100	.....	.....	Elastic limit.
11,800	59,000	.002250	.000250	.....	.....	
12,000	60,000	.003300	.001050	.....	.....	
12,400	62,000	.005200	.001900	.....	.....	
12,800	64,000	.006800	.001600	.....	.....	
13,200	66,000	.008300	.001500	.....	.....	
13,600	68,000	.010000	.001700	.....	.....	
14,000	70,000	.011500	.001500	.....	.....	
14,400	72,000	.013050	.001550	.....	.....	
14,800	74,000	.014550	.001500	.....	.....	
15,200	76,000	.016050	.001500	.....	.....	
15,600	78,000	.017900	.001850	.....	.....	
16,000	80,000	.019900	.002000	.....	.....	
16,400	82,000	.022000	.002100	.....	.....	
16,800	84,000	.024000	.002000	.....	.....	
17,200	86,000	.026150	.002150	.....	.....	
17,600	88,000	.028200	.002050	.....	.....	
18,000	90,000	.030850	.002650	.....	.....	
18,400	92,000	.033500	.002650	.....	.....	
18,800	94,000	.036500	.003000	.....	.....	
19,200	96,000	.040000	.003500	.....	.....	
19,600	98,000	.044500	.004500	.....	.....	
20,000	100,000	.049750	.005250	.....	.....	
20,400	102,000	.055250	.005500	.....	.....	
20,800	104,000	.061750	.006500	.....	.....	
21,200	106,000	.072000	.010250	.....	.....	
21,600	108,000	.0950	.0230	.....	.....	
21,920	109,600	.1500	.0550	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	109,600
Elastic limit per square inch of original section	do....	58,000
Elongation per inch after rupture	inch..	0.1950
Elongation per inch under strain at elastic limit	do....	.002000
Reduction in diameter at point of rupture	do....	.085
Reduction in area after rupture, per centum of original section		30.7
Position of rupture		″.70 from neck
Character of broken surface		silky, interspersed with fine granulation
Elongation of inch sections		″.25*, ″.14

No. 3421.

Marks, $\frac{32\ \text{Res T H}}{\text{T}_2\ \text{M}}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	.....	
2,000	10,000	.000300	.000200	0.	.....	
3,000	15,000	.000450	.000150	0.	.....	
4,000	20,000	.000600	.000150	0.	.....	
5,000	25,000	.000800	.000200	0.	.....	
6,000	30,000	.000950	.000150	0.	.....	
7,000	35,000	.001100	.000150	0.	.....	
8,000	40,000	.001300	.000200	0.	.....	
9,000	45,000	.001450	.000150	.....	.....	
10,000	50,000	.001600	.000150	.....	.....	
10,200	51,000	.001600	0.	.....	.....	
10,400	52,000	.001650	.000050	.....	.....	
10,600	53,000	.001700	.000050	.....	.....	
10,800	54,000	.001750	.000050	.....	.....	
11,000	55,000	.001750	0.	.....	.....	
11,200	56,000	.001800	.000050	.....	.....	
11,400	57,000	.001900	.000100	.....	.....	
11,600	58,000	.001950	.000050	.....	.....	
11,800	59,000	.002000	.000050	.....	.....	
12,000	60,000	.002100	.000100	.....	.....	Elastic limit.
12,200	61,000	.002850	.000750	.....	.....	
12,400	62,000	.003500	.000650	.....	.....	
12,800	64,000	.005550	.002050	.....	.....	
13,200	66,000	.006650	.001100	.....	.....	
13,600	68,000	.008500	.001850	.....	.....	
14,000	70,000	.009900	.001400	.....	.....	
14,400	72,000	.011500	.001600	.....	.....	
14,800	74,000	.013250	.001750	.....	.....	
15,200	76,000	.015000	.001750	.....	.....	
15,600	78,000	.016600	.001600	.....	.....	
16,000	80,000	.018400	.001800	.....	.....	
16,400	82,000	.020350	.001950	.....	.....	
16,800	84,000	.022400	.002050	.....	.....	
17,200	86,000	.024500	.002100	.....	.....	
17,600	88,000	.026650	.002150	.....	.....	
18,000	90,000	.029250	.002600	.....	.....	
18,400	92,000	.032250	.003000	.....	.....	
18,800	94,000	.035000	.002750	.....	.....	
19,200	96,000	.037800	.002800	.....	.....	
19,600	98,000	.041650	.003850	.....	.....	
20,000	100,000	.045850	.004200	.....	.....	
20,400	102,000	.051250	.005400	.....	.....	
20,800	104,000	.057000	.005750	.....	.....	
21,200	106,000	.0650	.0080	.....	.....	
21,600	108,000	.0950	.0300	.....	.....	
21,960	109,800	.1200	.0250	.....	.....	Tensile strength.

General summary.

nsile strength per square inch of original section	pounds..	109,800
astic limit per square inch of original section	do....	60,000
ngation per inch after rupture	inch..	0.1700
ngation per inch under strain at elastic limit	do....	.002100
duction in diameter at point of rupture	do....	.085
duction in area after rupture, per centum of original section		30.7
sition of rupture		1″ from neck
aracter of broken surface		granular; silky spot at the circumference
ngation of inch sections		″.13, ″.21*

No. 3595.

Marks, $\frac{32\ R_{60}\ T\ H}{T_1\ M}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	.....	
2,000	10,000	.000300	.000200	0.	.....	
3,000	15,000	.000500	.000200	0.	.....	
4,000	20,000	.000650	.000150	0.	.....	
5,000	25,000	.000800	.000150	0.	.....	
6,000	30,000	.000950	.000150	0.	.....	
7,000	35,000	.001100	.000150	0.	.....	
8,000	40,000	.001250	.000150	0.	.....	
9,000	45,000	.001400	.000150	.....	.....	
10,000	50,000	.001600	.000200	.....	.....	Elastic limit.
10,200	51,000	.001950	.000350	.....	.....	
10,400	52,000	.002450	.000500	.....	.....	
10,600	53,000	.003100	.000650	.....	.....	
10,800	54,000	.003900	.000800	.....	.....	
11,000	55,000	.004550	.000650	.....	.....	
11,200	56,000	.005100	.000550	.....	.....	
11,400	57,000	.005850	.000750	.....	.....	
11,600	58,000	.006500	.000650	.....	.....	
11,800	59,000	.007250	.000750	.....	.....	
12,000	60,000	.008000	.000750	.....	.....	
12,400	62,000	.009600	.001600	.....	.....	
12,800	64,000	.011200	.001600	.....	.....	
13,200	66,000	.012850	.001650	.....	.....	
13,600	68,000	.014500	.001650	.....	.....	
14,000	70,000	.016400	.001900	.....	.....	
14,400	72,000	.018400	.002000	.....	.....	
14,800	74,000	.020500	.002100	.....	.....	
15,200	76,000	.022500	.002000	.....	.....	
15,600	78,000	.025000	.002500	.....	.....	
16,000	80,000	.027400	.002400	.....	.....	
16,400	82,000	.030300	.002900	.....	.....	
16,800	84,000	.033250	.002950	.....	.....	
17,200	86,000	.036500	.003250	.....	.....	
17,600	88,000	.040400	.003900	.....	.....	
18,000	90,000	.044800	.004400	.....	.....	
18,400	92,000	.050400	.005600	.....	.....	
18,800	94,000	.057000	.006600	.....	.....	
19,200	96,000	.075600	.008600	.....	.....	
19,600	98,000	.0825	.0069	.....	.....	
20,000	100,000	.1050	.0225	.....	.....	
20,060	100,300	.1350	.0300	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	100,300
Elastic limit per square inch of original section	do....	50,000
Elongation per inch after rupture	inch..	0.1850
Elongation per inch under strain at elastic limit	do....	.001600
Reduction in diameter at point of rupture	do....	.095
Reduction in area after rupture, per centum of original section		34.0
Position of rupture		″.60 from neck
Character of broken surface		silky
Elongation of inch sections		″.10, ″.27*

No. 3596.

Marks, $\frac{32\ B_{20}\ T\ H}{T_2\ M}$
Diameter, ".505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000150	.000150	0.		
2,000	10,000	.000300	.000150	0.		
3,000	15,000	.000450	.000150	0.		
4,000	20,000	.000650	.000200	0.		
5,000	25,000	.000850	.000200	0.		
6,000	30,000	.001000	.000150	0.		
7,000	35,000	.001150	.000150	0.		
8,000	40,000	.001300	.000150	0.		
9,000	45,000	.001500	.000200			
9,200	46,000	.001600	.000100			
9,400	47,000	.001650	.000050			
9,600	48,000	.001700	.000050			
9,800	49,000	.001750	.000050			
10,000	50,000	.001800	.000050			
10,200	51,000	.001850	.000050			Elastic limit.
10,400	52,000	.003250	.001400			
10,600	53,000	.004550	.001300			
10,800	54,000	.005250	.000700			
11,000	55,000	.005850	.000600			
11,200	56,000	.006500	.000650			
11,400	57,000	.007200	.000700			
11,600	58,000	.007950	.000750			
11,800	59,000	.008800	.000850			
12,000	60,000	.009600	.000800			
12,400	62,000	.011100	.001500			
12,800	64,000	.012650	.001550			
13,200	66,000	.014500	.001850			
13,600	68,000	.016250	.001750			
14,000	70,000	.018100	.001850			
14,400	72,000	.020050	.001950			
14,800	74,000	.022250	.002200			
15,200	76,000	.024500	.002250			
15,600	78,000	.027000	.002500			
16,000	80,000	.029600	.002600			
16,400	82,000	.032850	.003250			
16,800	84,000	.036000	.003150			
17,200	86,000	.039400	.003400			
17,600	88,000	.044000	.004600			
18,000	90,000	.049000	.005000			
18,400	92,000	.054500	.005500			
18,800	94,000	.062750	.008250			
19,200	96,000	.0750	.012250			
19,600	98,000	.1000	.0250			
19,800	99,000	.1250	.0250			Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds	99,000
Elastic limit per square inch of original section	do	51,000
Elongation per inch after rupture	inch	0.2000
Elongation per inch under strain at elastic limit	do	.001850
Reduction in diameter at point of rupture	do	.085
Reduction in area after rupture, per centum of original section		30.7
Position of rupture		1" from neck
Character of broken surface		silky, 60 per cent.; granular, 40 per cent.
Elongation of inch sections		".15, ".25"

No. 3418.

Marks, $\frac{32\,R_m\,T\,H}{T_2\,M}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000150	.000150	0.	.....	
2,000	10,000	.000300	.000150	0.	.....	
3,000	15,000	.000450	.000150	0.	.....	
4,000	20,000	.000650	.000200	0.	.....	
5,000	25,000	.000850	.000200	0.	.....	
6,000	30,000	.001000	.000150	0.	.....	
7,000	35,000	.001200	.000200	0.	.....	
8,000	40,000	.001350	.000150	0.	.....	
9,000	45,000	.001500	.000150	.....	.....	
9,200	46,000	.001550	.000050	.....	.....	
9,400	47,000	.001650	.000100	.....	.....	
9,600	48,000	.001700	.000050	.....	.....	
9,800	49,000	.001750	.000050	.....	.....	
10,000	50,000	.001800	.000050	.....	.....	
10,200	51,000	.001850	.000050	.....	.....	
10,400	52,000	.001950	.000100	.....	.....	Elastic limit.
10,600	53,000	.003500	.001550	.....	.....	
10,800	54,000	.005250	.001750	.....	.....	
11,000	55,000	.006500	.001250	.....	.....	
11,200	56,000	.007500	.001000	.....	.....	
11,400	57,000	.008000	.000500	.....	.....	
11,600	58,000	.008600	.000600	.....	.....	
11,800	59,000	.009300	.000700	.....	.....	
12,000	60,000	.010250	.000950	.....	.....	
12,400	62,000	.011700	.001450	.....	.....	
12,800	64,000	.014000	.002300	.....	.....	
13,200	66,000	.016000	.002000	.....	.....	
13,600	68,000	.017750	.001750	.....	.....	
14,000	70,000	.019550	.001800	.....	.....	
14,400	72,000	.021750	.002200	.....	.....	
14,800	74,000	.024100	.002350	.....	.....	
15,200	76,000	.026500	.002400	.....	.....	
15,600	78,000	.029000	.002500	.....	.....	
16,000	80,000	.031500	.002500	.....	.....	
16,400	82,000	.034800	.003300	.....	.....	
16,800	84,000	.039500	.004700	.....	.....	
17,200	86,000	.043500	.004000	.....	.....	
17,600	88,000	.048250	.004750	.....	.....	
18,000	90,000	.054500	.006250	.....	.....	
18,400	92,000	.0600	.0055	.....	.....	
18,800	94,000	.0800	.0200	.....	.....	
19,200	96,000	.1050	.0250	.....	.....	
19,260	96,300	.1300	.0250	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	96,300
Elastic limit per square inch of original section	do....	52,000
Elongation per inch after rupture	inch..	0.1500
Elongation per inch under strain at elastic limit	do....	.001950
Reduction in diameter at point of rupture	do....	.065
Reduction in area after rupture, per centum of original section		23.9
Position of rupture		″.85 from neck
Character of broken surface		granular, 40 per cent.; dull silky, 60 per cent.
Elongation of inch sections		″.20*, ″.10

No. 3419.

Marks, $\frac{32\ R_{20}\ T\ H}{T_4\ M}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000150	.000150	0.	.....	
2,000	10,000	.000300	.000150	0.	.....	
3,000	15,000	.000450	.000150	0.	.....	
4,000	20,000	.000650	.000200	0.	.....	
5,000	25,000	.000850	.000200	0.	.....	
6,000	30,000	.001000	.000150	0.	.....	
7,000	35,000	.001200	.000200	0.	.....	
8,000	40,000	.001350	.000150	0.	.....	
9,000	45,000	.001550	.000200	.....	.....	
10,000	50,000	.001700	.000150	.....	.....	
10,200	51,000	.001750	.000050	.....	.....	
10,400	52,000	.001800	.000050	.....	.....	
10,600	53,000	.001850	.000050	.....	.....	Elastic limit.
10,800	54,000	.003000	.001150	.....	.....	
11,000	55,000	.005000	.002000	.....	.....	
11,200	56,000	.006000	.001000	.....	.....	
11,400	57,000	.006750	.000750	.....	.....	
11,600	58,000	.007500	.000750	.....	.....	
11,800	59,000	.008100	.000600	.....	.....	
12,000	60,000	.008850	.000750	.....	.....	
12,400	62,000	.010350	.001500	.....	.....	
12,800	64,000	.012100	.001750	.....	.....	
13,200	66,000	.013900	.001800	.....	.....	
13,600	68,000	.015650	.001750	.....	.....	
14,000	70,000	.017500	.001850	.....	.....	
14,400	72,000	.019750	.002250	.....	.....	
14,800	74,000	.022000	.002250	.....	.....	
15,200	76,000	.024250	.002250	.....	.....	
15,600	78,000	.027000	.002750	.....	.....	
16,000	80,000	.029900	.002900	.....	.....	
16,400	82,000	.032900	.003000	.....	.....	
16,800	84,000	.036100	.003200	.....	.....	
17,200	86,000	.040000	.003900	.....	.....	
17,600	88,000	.044800	.004800	.....	.....	
18,000	90,000	.050050	.005250	.....	.....	
18,400	92,000	.056750	.006700	.....	.....	
18,800	94,000	.0650	.008250	.....	.....	
19,200	96,000	.0850	.0200	.....	.....	
19,510	97,550	.1300	.0450	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	97,550
Elastic limit per square inch of original section	do ...	53,000
Elongation per inch after rupture	inch..	0.1550
Elongation per inch under strain at elastic limit	do....	.001850
Reduction in diameter at point of rupture	do....	.065
Reduction in area after rupture, per centum of original section		23.9
Position of rupture		″.45 from neck
Character of broken surface		granular, 60 per cent.; silky, 40 per cent.
Elongation of inch sections		″.11, ″.20*

No. 3597.

Marks, $\frac{32\ R_{30}\ T\ H}{T_5\ M}$
Diameter, ′.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	.....	
2,000	10,000	.000300	.000200	0.	.....	
3,000	15,000	.000500	.000200	0.	.....	
4,000	20,000	.000650	.000150	0.	.....	
5,000	25,000	.000850	.000200	0.	.....	
6,000	30,000	.001000	.000150	0.	.....	
7,000	35,000	.001150	.000150	0.	.....	
8,000	40,000	.001350	.000200	0.	.....	
9,000	45,000	.001500	.000150	.....	.....	
10,000	50,000	.001650	.000150	.....	.....	
10,200	51,000	.001700	.000050	.....	.....	Elastic limit.
10,400	52,000	.004100	.002400	.....	.....	
10,600	53,000	.005150	.001050	.....	.....	
10,800	54,000	.006100	.000950	.....	.....	
11,000	55,000	.007100	.001000	.....	.....	
11,200	56,000	.007900	.000800	.....	.....	
11,400	57,000	.008850	.000950	.....	.....	
11,600	58,000	.009600	.000750	.....	.....	
11,800	59,000	.010500	.000900	.....	.....	
12,000	60,000	.011550	.001050	.....	.....	
12,400	62,000	.013250	.001700	.....	.....	
12,800	64,000	.015400	.002150	.....	.....	
13,200	66,000	.017450	.002050	.....	.....	
13,600	68,000	.019600	.002150	.....	.....	
14,000	70,000	.021900	.002300	.....	.....	
14,400	72,000	.024500	.002600	.....	.....	
14,800	74,000	.027300	.002800	.....	.....	
15,200	76,000	.030250	.002950	.....	.....	
15,600	78,000	.033500	.003250	.....	.....	
16,000	80,000	.037250	.003750	.....	.....	
16,400	82,000	.041750	.004500	.....	.....	
16,800	84,000	.046900	.005150	.....	.....	
17,200	86,000	.053000	.006100	.....	.....	
17,600	88,000	.061950	.008950	.....	.....	
18,000	90,000	.0700	.008050	.....	.....	
18,400	92,000	.0950	.0250	.....	.....	
18,700	93,500	.1400	.0450	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	93,500
Elastic limit per square inch of original section	do ...	51,000
Elongation per inch after rupture	inch..	0.2100
Elongation per inch under strain at elastic limit	do....	.001700
Reduction in diameter at point of rupture	do....	.105
Reduction in area after rupture, per centum of original section		37.1
Position of rupture		1″.10 from neck
Character of broken surface		silky; slightly granular at circumference
Elongation of inch sections		″.24*, ″.18

No. 3598.

Marks, $\frac{32\ R_{60}\ T\ H}{T_6\ M}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000150	.000150	0.	.....	
2,000	10,000	.000300	.000150	0.	.....	
3,000	15,000	.000450	.000150	0.	.....	
4,000	20,000	.000650	.000200	0.	.....	
5,000	25,000	.000850	.000200	0.	.....	
6,000	30,000	.001000	.000150	0.	.....	
7,000	35,000	.001200	.000200	0.	.....	
8,000	40,000	.001350	.000150	0.	.....	
9,000	45,000	.001500	.000150	.....	.....	
9,600	48,000	.001700	.000200	.....	.....	Elastic limit.
9,800	49,000	.003000	.001300	.....	.....	
10,000	50,000	.005450	.002450	.....	.....	
10,200	51,000	.006150	.000700	.....	.....	
10,400	52,000	.007000	.000850	.....	.....	
10,600	53,000	.007600	.000600	.....	.....	
10,800	54,000	.008500	.000900	.....	.....	
11,000	55,000	.009250	.000750	.....	.....	
11,200	56,000	.010100	.000850	.....	.....	
11,400	57,000	.011050	.000950	.....	.....	
11,600	58,000	.012250	.001200	.....	.....	
11,800	59,000	.013400	.001150	.....	.....	
12,000	60,000	.014500	.001100	.....	.....	
12,400	62,000	.016200	.001700	.....	.....	
12,800	64,000	.018200	.002000	.....	.....	
13,200	66,000	.020350	.002150	.....	.....	
13,600	68,000	.022800	.002450	.....	.....	
14,000	70,000	.025500	.002700	.....	.....	
14,400	72,000	.028100	.002600	.....	.....	
14,800	74,000	.031500	.003400	.....	.....	
15,200	76,000	.034750	.003250	.....	.....	
15,600	78,000	.038750	.004000	.....	.....	
16,000	80,000	.043150	.004400	.....	.....	
16,400	82,000	.048350	.005200	.....	.....	
16,800	84,000	.054750	.006400	.....	.....	
17,200	86,000	.0630	.008250	.....	.....	
17,600	88,000	.0700	.0070	.....	.....	
18,000	90,000	.0900	.0200	.....	.....	
18,290	91,450	.1450	.0550	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	91,450
Elastic limit per square inch of original section	do....	48,000
Elongation per inch after rupture	inch..	0.1950
Elongation per inch under strain at elastic limit	do....	.001700
Reduction in diameter at point of rupture	do....	.085
Reduction in area after rupture, per centum of original section		30.7
Position of rupture		1″.05 from neck
Character of broken surface		granular, 60 per cent.; silky, 40 per cent.
Elongation of inch sections		″.22*, ″.17

No. 3687.

Marks, $\frac{32\ R_{60}\ T\ H}{T_2\ M}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000150	.000150	0.	.....	
2,000	10,000	.000300	.000150	0.	.....	
3,000	15,000	.000500	.000200	0.	.....	
4,000	20,000	.000700	.000200	0.	.....	
5,000	25,000	.000850	.000150	0.	.....	
6,000	30,000	.001000	.000150	0.	.....	
7,000	35,000	.001200	.000200	0.	.....	
8,000	40,000	.001350	.000150	0.	.....	
9,000	45,000	.001500	.000150	.....	.....	
10,000	50,000	.001700	.000200	.....	.....	
10,200	51,000	.001750	.000050	.....	.....	
10,400	52,000	.001800	.000050	.....	.....	
10,600	53,000	.001850	.000050	.....	.....	
10,800	54,000	.001900	.000050	.....	.....	
11,000	55,000	.001900	0.	.....	.....	Elastic limit.
11,200	56,000	.002100	.000200	.....	.....	
11,400	57,000	.002300	.000200	.....	.....	
11,600	58,000	.002550	.000250	.....	.....	
11,800	59,000	.002850	.000300	.....	.....	
12,000	60,000	.004050	.001200	.....	.....	
12,400	62,000	.006150	.002100	.....	.....	
12,800	64,000	.007750	.001500	.....	.....	
13,200	66,000	.010000	.002250	.....	.....	
13,600	68,000	.011550	.001550	.....	.....	
14,000	70,000	.013250	.001700	.....	.....	
14,400	72,000	.015200	.001950	.....	.....	
14,800	74,000	.017000	.001800	.....	.....	
15,200	76,000	.019500	.002500	.....	.....	
15,600	78,000	.021150	.001650	.....	.....	
16,000	80,000	.023350	.002200	.....	.....	
16,400	82,000	.025850	.002500	.....	.....	
16,800	84,000	.028500	.002650	.....	.....	
17,200	86,000	.031250	.002750	.....	.....	
17,600	88,000	.034750	.003500	.....	.....	
18,000	90,000	.038750	.004000	.....	.....	
18,400	92,000	.042900	.004150	.....	.....	
18,800	94,000	.0500	.0071	.....	.....	
19,200	96,000	.0550	.0050	.....	.....	
19,600	98,000	.0650	.0100	.....	.....	
20,000	100,000	.0800	.0150	.....	.....	
20,400	102,000	.1150	.0350	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	102,000
Elastic limit per square inch of original section	do....	55,000
Elongation per inch after rupture	inch..	0.2500
Elongation per inch under strain at elastic limit	do....	.001900
Reduction in diameter at point of rupture	do....	.125
Reduction in area after rupture, per centum of original section		43.8
Position of rupture		1″.20 from neck
Character of broken surface		silky
Elongation of inch sections		″.27*, ″.23

No. 3688.

Marks, $\frac{32\ R_2\ T\ H}{T_4\ M}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000150	.000150	0.		
2,000	10,000	.000300	.000150	0.		
3,000	15,000	.000450	.000150	0.		
4,000	20,000	.000650	.000200	0.		
5,000	25,000	.000850	.000200	0.		
6,000	30,000	.001000	.000150	0.		
7,000	35,000	.001150	.000150	0.		
8,000	40,000	.001300	.000150	0.		
9,000	45,000	.001500	.000200			
10,000	50,000	.001650	.000150			
10,200	51,000	.001700	.000050			
10,400	52,000	.001750	.000050			
10,600	53,000	.001800	.000050			
10,800	54,000	.001850	.000050			
11,000	55,000	.001900	.000050			Elastic limit.
11,200	56,000	.002050	.000150			
11,400	57,000	.002150	.000100			
11,600	58,000	.002400	.000250			
11,800	59,000	.003200	.000800			
12,000	60,000	.004250	.001050			
12,400	62,000	.006300	.002050			
12,800	64,000	.007950	.001650			
13,200	66,000	.009750	.001800			
13,600	68,000	.011350	.001600			
14,000	70,000	.013100	.001750			
14,400	72,000	.014900	.001800			
14,800	74,000	.016900	.002000			
15,200	76,000	.018600	.001700			
15,600	78,000	.020600	.002000			
16,000	80,000	.023050	.002450			
16,400	82,000	.025550	.002500			
16,800	84,000	.028350	.002800			
17,200	86,000	.031000	.002650			
17,600	88,000	.034050	.003050			
18,000	90,000	.037750	.003700			
18,400	92,000	.041900	.004150			
18,800	94,000	.047500	.005600			
19,200	96,000	.0500	.0025			
19,600	98,000	.0575	.0075			
20,000	100,000	.0750	.0175			
20,400	102,000	.1050	.0300			
20,440	102,200	.1250	.0200			Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	102,200
Elastic limit per square inch of original section	do....	55,000
Elongation per inch after rupture	inch..	0.1850
Elongation per inch under strain at elastic limit	do....	.001900
Reduction in diameter at point of rupture	do....	.065
Reduction in area after rupture, per centum of original section		30.7
Position of rupture		″.70 inch from neck
Character of broken surface		granular, radiating from a dull silky spot at circumference
Elongation of inch sections		″.12, ″.25

No. 3576.

Marks, $\frac{32\ R_{23}\ T\ H}{T,\ M}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	.....	
2,000	10,000	.000300	.000200	0.	.....	
3,000	15,000	.000450	.000150	0.	.....	
4,000	20,000	.000650	.000200	0.	.....	
5,000	25,000	.000800	.000150	0.	.....	
6,000	30,000	.000950	.000150	0.	.....	
7,000	35,000	.001150	.000200	0.	.....	
8,000	40,000	.001350	.000200	0.	.....	
9,000	45,000	.001550	.000200	.....	.....	
9,200	46,000	.001600	.000050	.....	.....	
9,400	47,000	.001650	.000050	.....	.....	Elastic limit.
9,600	48,000	.003750	.002100	.....	.....	
9,800	49,000	.005050	.001250	.....	.....	
10,000	50,000	.005850	.000800	.....	.....	
10,200	51,000	.006350	.000500	.....	.....	
10,400	52,000	.006750	.000400	.....	.....	
10,600	53,000	.007650	.000900	.....	.....	
10,800	54,000	.008600	.000950	.....	.....	
11,000	55,000	.009500	.000900	.....	.....	
11,200	56,000	.010250	.000750	.....	.....	
11,600	58,000	.012100	.001850	.....	.....	
12,000	60,000	.014000	.001900	.....	.....	
12,400	62,000	.015600	.001600	.....	.....	
12,800	64,000	.017600	.002000	.....	.....	
13,200	66,000	.019600	.002000	.....	.....	
13,600	68,000	.022250	.002650	.....	.....	
14,000	70,000	.024500	.002250	.....	.....	
14,400	72,000	.027300	.002800	.....	.....	
14,800	74,000	.030550	.003250	.....	.....	
15,200	76,000	.034250	.003700	.....	.....	
15,600	78,000	.037500	.003250	.....	.....	
16,000	80,000	.041500	.004000	.....	.....	
16,400	82,000	.046300	.004800	.....	.....	
16,800	84,000	.052500	.006200	.....	.....	
17,200	86,000	.060000	.007500	.....	.....	
17,600	88,000	.072500	.012500	.....	.....	
18,000	90,000	.0850	.0125	.....	.....	
18,360	91,800	.1400	.0550	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	91,800
Elastic limit per square inch of original section	do ...	47,000
Elongation per inch after rupture	inch..	0.2150
Elongation per inch under strain at elastic limit	do....	.001650
Reduction in diameter at point of rupture	do....	.105
Reduction in area after rupture, per centum of original section		37.1
Position of rupture		″.85 from neck
Character of broken surface		silky
Elongation of inch sections		″.30*, ″.13

No. 3577.

Marks, $\frac{32\ \text{Rs}\ \text{T}\ \text{H}}{\text{T, M}}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.		
2,000	10,000	.000300	.000200	0.		
3,000	15,000	.000450	.000150	0.		
4,000	20,000	.000600	.000150	0.		
5,000	25,000	.000800	.000200	0.		
6,000	30,000	.000950	.000150	0.		
7,000	35,000	.001100	.000150	0.		
8,000	40,000	.001300	.000200	.000050	.000050	
9,000	45,000	.001450	.000150			
9,200	46,000	.001550	.000100			Elastic limit.
9,400	47,000	.006100	.004550			
9,600	48,000	.006500	.000400			
9,800	49,000	.007000	.000500			
10,000	50,000	.007600	.000600			
10,200	51,000	.008500	.000900			
10,400	52,000	.009150	.000650			
10,600	53,000	.010000	.000850			
10,800	54,000	.011100	.001100			
11,000	55,000	.011900	.000800			
11,200	56,000	.012600	.000700			
11,600	58,000	.014500	.001900			
12,000	60,000	.016750	.002250			
12,400	62,000	.019200	.002450			
12,800	64,000	.021500	.002300			
13,200	66,000	.023750	.002250			
13,600	68,000	.026500	.002750			
14,000	70,000	.029250	.002750			
14,400	72,000	.032550	.003300			
14,800	74,000	.036000	.003450			
15,200	76,000	.039800	.003800			
15,600	78,000	.045250	.005450			
16,000	80,000	.051000	.005750			
16,400	82,000	.058000	.007000			
16,800	84,000	.0660	.0080			
17,200	86,000	.0800	.0140			
17,600	88,000	.1000	.0200			
17,820	89,100	.1500	.0500			Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds	89,10
Elastic limit per square inch of original section	do	46,00
Elongation per inch after rupture	inch	0.250
Elongation per inch under strain at elastic limit	do	.00150
Reduction in diameter at point of rupture	do	.10
Reduction in area after rupture, per centum of original section		37.
Position of rupture		″.55 from neck
Character of broken surface	silky; granular spot near the circumferen	
Elongation of inch sections		″.19, ″.21

No. 3607.

Marks, $\frac{32\,R_{m}\,T\,H}{T_{2}\,M}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads. Total.	Applied loads. Per square inch.	Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000150	.000150	0.	.....	
2,000	10,000	.000250	.000100	0.	.....	
3,000	15,000	.000450	.000200	0.	.....	
4,000	20,000	.000600	.000150	0.	.....	
5,000	25,000	.000750	.000150	0.	.....	
6,000	30,000	.000950	.000200	0.	.....	
7,000	35,000	.001100	.000150	0.	.....	
8,000	40,000	.001250	.000150	0.	.....	
9,000	45,000	.001400	.000150	.....	.....	
9,200	46,000	.001400	0.	.....	.....	
9,400	47,000	.001450	.000050	.....	.....	
9,600	48,000	.001450	0.	.....	.....	
9,800	49,000	.001500	.000050	.....	.....	
10,000	50,000	.001550	.000050	.....	.....	
10,200	51,000	.001600	.000050	.....	.....	
10,400	52,000	.001650	.000050	.....	.....	
10,600	53,000	.001700	.000050	.....	.....	Elastic limit.
10,800	54,000	.002250	.000550	.....	.....	
11,000	55,000	.003250	.001000	.....	.....	
11,200	56,000	.004050	.000800	.....	.....	
11,400	57,000	.004850	.000800	.....	.....	
11,600	58,000	.005500	.000650	.....	.....	
11,800	59,000	.006100	.000600	.....	.....	
12,000	60,000	.007000	.000900	.....	.....	
12,400	62,000	.008750	.001750	.....	.....	
12,800	64,000	.010500	.001750	.....	.....	
13,200	66,000	.012250	.001750	.....	.....	
13,600	68,000	.013500	.001250	.....	.....	
14,000	70,000	.015550	.002050	.....	.....	
14,400	72,000	.017850	.002300	.....	.....	
14,800	74,000	.020550	.002700	.....	.....	
15,200	76,000	.022900	.002350	.....	.....	
15,600	78,000	.025250	.002350	.....	.....	
16,000	80,000	.028000	.002750	.....	.....	
16,400	82,000	.030500	.002500	.....	.....	
16,800	84,000	.034500	.004000	.....	.....	
17,200	86,000	.038400	.003900	.....	.....	
17,600	88,000	.041250	.002850	.....	.....	
18,000	90,000	.044500	.003250	.....	.....	
18,400	92,000	.048900	.004400	.....	.....	
18,800	94,000	.054000	.005100	.....	.....	
19,200	96,000	.060650	.006650	.....	.....	
19,600	98,000	.0750	.014350	.....	.....	
20,000	100,000	.0950	.0200	.....	.....	
20,180	100,900	.1300	.0350	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section.....pounds . 100,900
Elastic limit per square inch of original section.....do.... 53,000
Elongation per inch after rupture.....inch.. 0.1600
Elongation per inch under strain at elastic limit.....do ... .001700
Reduction in diameter at point of rupture.....do.... .075
[illegible]ction in area after rupture, per centum of original section..... 27.4
[illegible]tion of rupture.....″.95 from neck
[illegible]eter of broken surface, granular; dull spot at the circumference. Opened cracks in the surface [illegible]tem.
[illegible]tion of inch sections.....″.11, ″.21*

No. 3608.

Marks, $\frac{32\ R_B\ T\ H}{T_1\ M}$
Diameter, ".505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000150	.000150	0.		
2,000	10,000	.000300	.000150	0.		
3,000	15,000	.000450	.000150	0.		
4,000	20,000	.000650	.000200	0.		
5,000	25,000	.000800	.000150	0.		
6,000	30,000	.000950	.000150	0.		
7,000	35,000	.001100	.000150	0.		
8,000	40,000	.001300	.000200	0.		
9,000	45,000	.001450	.000150			
9,200	46,000	.001500	.000050			
9,400	47,000	.001550	.000050			
9,600	48,000	.001600	.000050			
9,800	49,000	.001650	.000050			
10,000	50,000	.001750	.000100			Elastic limit.
10,200	51,000	.003000	.001250			
10,400	52,000	.004350	.001350			
10,600	53,000	.005100	.000750			
10,800	54,000	.005850	.000750			
11,000	55,000	.006600	.000750			
11,200	56,000	.007400	.000800			
11,400	57,000	.008050	.000650			
11,600	58,000	.008600	.000550			
11,800	59,000	.009400	.000800			
12,000	60,000	.010200	.000800			
12,400	62,000	.012000	.001800			
12,800	64,000	.014000	.002000			
13,200	66,000	.015550	.001550			
13,600	68,000	.017050	.001500			
14,000	70,000	.019850	.002800			
14,400	72,000	.022000	.002150			
14,800	74,000	.024000	.002000			
15,200	76,000	.026500	.002500			
15,600	78,000	.029050	.002550			
16,000	80,000	.032100	.003050			
16,400	82,000	.036900	.004800			
16,800	84,000	.040500	.003600			
17,200	86,000	.044000	.003500			
17,600	88,000	.050000	.006000			
18,000	90,000	.0550	.0050			
18,400	92,000	.0625	.0075			
18,800	94,000	.0800	.0175			
19,200	96,000	.0950	.0150			
19,500	97,500	.1450	.0500			Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds	97,500
Elastic limit per square inch of original section	do	50,000
Elongation per inch after rupture	inch	0.1850
Elongation per inch under strain at elastic limit	do	.001750
Reduction in diameter at point of rupture	do	.065
Reduction in area after rupture, per centum of original section		23.9
Position of rupture		1".10 from neck
Character of broken surface		granular; dull spot at the circumference
Elongation of inch sections		".21" ".16

No. 3422.

Marks, $\frac{22\ \text{Rm}\ T\ H}{T,\ M}$
Diameter, ".505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000150	.000150	0.	.....	
2,000	10,000	.000350	.000200	0.	.....	
3,000	15,000	.000500	.000150	0.	.....	
4,000	20,000	.000650	.000150	0.	.....	
5,000	25,000	.000800	.000150	0.	.....	
6,000	30,000	.000950	.000150	0.	.....	
7,000	35,000	.001100	.000150	0.	.....	
8,000	40,000	.001250	.000150	0.	.....	
9,000	45,000	.001400	.000150	.....	.....	
9,200	46,000	.001450	.000050	.....	.....	Elastic limit.
9,400	47,000	.001500	.000050	.....	.....	
9,600	48,000	.001900	.000400	.....	.....	
9,800	49,000	.002550	.000650	.....	.....	
10,000	50,000	.005050	.002500	.....	.....	
10,200	51,000	.006500	.001450	.....	.....	
10,400	52,000	.007000	.000500	.....	.....	
10,600	53,000	.007700	.000700	.....	.....	
10,800	54,000	.008500	.000800	.....	.....	
11,000	55,000	.009350	.000850	.....	.....	
11,200	56,000	.010400	.001050	.....	.....	
11,400	57,000	.011500	.001100	.....	.....	
11,600	58,000	.012250	.000750	.....	.....	
11,800	59,000	.013400	.001150	.....	.....	
12,000	60,000	.014400	.001000	.....	.....	
12,400	62,000	.016250	.001850	.....	.....	
12,800	64,000	.018250	.002000	.....	.....	
13,200	66,000	.020750	.002500	.....	.....	
13,600	68,000	.023400	.002650	.....	.....	
14,000	70,000	.026200	.002800	.....	.....	
14,400	72,000	.029000	.002800	.....	.....	
14,800	74,000	.032400	.003400	.....	.....	
15,200	76,000	.036050	.003650	.....	.....	
15,600	78,000	.040000	.003950	.....	.....	
16,000	80,000	.045000	.005000	.....	.....	
16,400	82,000	.051500	.006500	.....	.....	
16,800	84,000	.059100	.007600	.....	.....	
17,200	86,000	.070500	.011400	.....	.....	
17,600	88,000	.0900	.0195	.....	.....	
17,990	89,950	.1350	.0450	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	89,950
Elastic limit per square inch of original section	do....	47,000
Elongation per inch after rupture	inch..	0.2150
Elongation per inch under strain at elastic limit	do....	.001500
Reduction in diameter at point of rupture	do....	.095
Reduction in area after rupture, per centum of original section		34.0
Position of rupture		".70 from neck
Character of broken surface		granular, 50 per cent.; silky, 50 per cent.
Elongation of inch sections		".28", ".15

No. 3423.

Marks, $\frac{32\ R_{st}\ T\ H}{Ts\ M}$
Diameter, ".505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000150	.000150	0.		
2,000	10,000	.000300	.000150	0.		
3,000	15,000	.000500	.000200	0.		
4,000	20,000	.000700	.000200	0.		
5,000	25,000	.000850	.000150	0.		
6,000	30,000	.001000	.000150	0.		
7,000	35,000	.001150	.000150	0.		
8,000	40,000	.001350	.000200	0.		
9,000	45,000	.001550	.000200			
9,200	46,000	.001600	.000050			
9,400	47,000	.001700	.000100			Elastic limit.
9,600	48,000	.003050	.001350			
9,800	49,000	.006000	.002950			
10,000	50,000	.006750	.000750			
10,200	51,000	.007300	.000550			
10,400	52,000	.008050	.000750			
10,600	53,000	.008600	.000550			
10,800	54,000	.009500	.000900			
11,000	55,000	.010550	.001050			
11,200	56,000	.011500	.000950			
11,400	57,000	.012250	.000750			
11,600	58,000	.013100	.000850			
11,800	59,000	.014000	.000900			
12,000	60,000	.015000	.001000			
12,400	62,000	.016900	.001900			
12,800	64,000	.019100	.002200			
13,200	66,000	.021500	.002400			
13,600	68,000	.023900	.002400			
14,000	70,000	.026900	.003000			
14,400	72,000	.030000	.003100			
14,800	74,000	.033050	.003050			
15,200	76,000	.036600	.003550			
15,600	78,000	.040400	.003800			
16,000	80,000	.045500	.005100			
16,400	82,000	.051500	.006000			
16,800	84,000	.0550	.0035			
17,200	86,000	.0625	.0075			
17,600	88,000	.0800	.0175			
18,000	90,000	.1100	.0300			
18,050	90,250	.1500	.0400			Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	90,250
Elastic limit per square inch of original section	do....	47,000
Elongation per inch after rupture	inch..	0.2200
Elongation per inch under strain at elastic limit	do....	.001700
Reduction in diameter at point of rupture	do....	.095
Reduction in area after rupture, per centum of original section		34.0
Position of rupture		".85 from neck
Character of broken surface	granular, 50 per cent.; silky, 50 per cent.	
Elongation of inch sections		".28", ".16

No. 3540.

Marks, $\frac{22\ R_4\ T\ H}{T_3\ M}$
Diameter, ".505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000150	.000150	0.	.....	
2,000	10,000	.000350	.000200	0.	.....	
3,000	15,000	.000550	.000200	0.	.....	
4,000	20,000	.000700	.000150	0.	.....	
5,000	25,000	.000850	.000150	0.	.....	
6,000	30,000	.001000	.000150	0.	.....	
7,000	35,000	.001150	.000150	0.	.....	
8,000	40,000	.001350	.000200	0.	.....	
9,000	45,000	.001500	.000150	.....	.....	
10,000	50,000	.001700	.000200	.....	.....	
10,200	51,000	.001750	.000050	.....	.....	
10,400	52,000	.001800	.000050	.....	.....	
10,600	53,000	.001850	.000050	.....	.....	
10,800	54,000	.001850	0.	.....	.....	
11,000	55,000	.001900	.000050	.....	.....	Elastic limit.
11,200	56,000	.002700	.000800	.....	.....	
11,400	57,000	.004550	.001850	.....	.....	
11,600	58,000	.005200	.000650	.....	.....	
11,800	59,000	.006000	.000800	.....	.....	
12,000	60,000	.007050	.001050	.....	.....	
12,400	62,000	.008850	.001800	.....	.....	
12,800	64,000	.010300	.001450	.....	.....	
13,200	66,000	.012000	.001700	.....	.....	
13,600	68,000	.013600	.001600	.....	.....	
14,000	70,000	.015500	.001900	.....	.....	
14,400	72,000	.017400	.001900	.....	.....	
14,800	74,000	.019350	.001950	.....	.....	
15,200	76,000	.021350	.002000	.....	.....	
15,600	78,000	.023700	.002350	.....	.....	
16,000	80,000	.026050	.002350	.....	.....	
16,400	82,000	.028700	.002650	.....	.....	
16,800	84,000	.031450	.002750	.....	.....	
17,200	86,000	.034600	.003150	.....	.....	
17,600	88,000	.038400	.003800	.....	.....	
18,000	90,000	.042250	.003850	.....	.....	
18,400	92,000	.047500	.005250	.....	.....	
18,800	94,000	.0525	.0050	.....	.....	
19,200	96,000	.0600	.0075	.....	.....	
19,600	98,000	.0650	.0050	.....	.....	
20,000	100,000	.1000	.0350	.....	.....	
20,060	100,300	.1100	.0100	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	100,300
Elastic limit per square inch of original section	do....	55,000
Elongation per inch after rupture	inch..	0.1800
Elongation per inch under strain at elastic limit	do....	.001900
Reduction in diameter at point of rupture	do....	.075
Reduction in area after rupture, per centum of original section		27.4
Position of rupture		".95 from neck
Character of broken surface		granular, 70 per cent.; dull flaky, 30 per cent.
Elongation of inch sections		".20", ".16

No. 3541.

Marks, $\frac{32\ R_{34}\ T\ H}{T_4\ M}$
Diameter, ".505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	.....	
2,000	10,000	.000250	.000150	0.	.....	
3,000	15,000	.000400	.000150	0.	.....	
4,000	20,000	.000550	.000150	0.	.....	
5,000	25,000	.000750	.000200	0.	.....	
6,000	30,000	.000900	.000150	0.	.....	
7,000	35,000	.001050	.000150	0.	.....	
8,000	40,000	.001200	.000150	0.	.....	
9,000	45,000	.001350	.000150	.....	.....	
10,000	50,000	.001500	.000150	.....	.....	
10,200	51,000	.001550	.000050	.....	.....	
10,400	52,000	.001600	.000050	.....	.....	Elastic limit.
10,600	53,000	.001800	.000200	.....	.....	
10,800	54,000	.002800	.001000	.....	.....	
11,000	55,000	.003950	.001150	.....	.....	
11,200	56,000	.005050	.001100	.....	.....	
11,400	57,000	.005850	.000800	.....	.....	
11,600	58,000	.006550	.000700	.....	.....	
11,800	59,000	.007350	.000800	.....	.....	
12,000	60,000	.008350	.001000	.....	.....	
12,400	62,000	.009850	.001500	.....	.....	
12,800	64,000	.011550	.001700	.....	.....	
13,200	66,000	.013250	.001700	.....	.....	
13,600	68,000	.015000	.001750	.....	.....	
14,000	70,000	.016850	.001850	.....	.....	
14,400	72,000	.018800	.001950	.....	.....	
14,800	74,000	.020850	.002050	.....	.....	
15,200	76,000	.023100	.002250	.....	.....	
15,600	78,000	.025550	.002450	.....	.....	
16,000	80,000	.028150	.002600	.....	.....	
16,400	82,000	.030850	.002700	.....	.....	
16,800	84,000	.034100	.003250	.....	.....	
17,200	86,000	.037800	.003700	.....	.....	
17,600	88,000	.041850	.004050	.....	.....	
18,000	90,000	.046600	.004750	.....	.....	
18,400	92,000	.0525	.0050	.....	.....	
18,800	94,000	.0575	.0050	.....	.....	
19,200	96,000	.0650	.0075	.....	.....	
19,600	98,000	.0850	.0200	.....	.....	
19,800	99,000	.1150	.0300	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	99,000
Elastic limit per square inch of original section	do....	53,000
Elongation per inch after rupture	inch..	0.1500
Elongation per inch under strain at elastic limit	do....	.001600
Reduction in diameter at point of rupture	do....	.065
Reduction in area after rupture, per centum of original section		22.9
Position of rupture		".70 from neck

Character of broken surface, granular, 70 per cent.; dull silky, 30 per cent. Opened cracks in steel near the place of rupture.
Elongation of inch sections ..... ".10, ".30"

No. 3641.

Marks, $\frac{32\ R_{64}\ T\ H}{T_3\ M}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	.....	
2,000	10,000	.000250	.000150	0.	.....	
3,000	15,000	.000450	.000200	0.	.....	
4,000	20,000	.000650	.000200	0.	.....	
5,000	25,000	.000800	.000150	0.	.....	
6,000	30,000	.000950	.000150	0.	.....	
7,000	35,000	.001100	.000150	0.	.....	
8,000	40,000	.001250	.000150	0.	.....	
9,000	45,000	.001450	.000200	.....	.....	
10,000	50,000	.001600	.000150	.....	.....	
10,200	51,000	.001650	.000050	.....	.....	
10,400	52,000	.001700	.000050	.....	.....	
10,600	53,000	.001750	.000050	.....	.....	
10,800	54,000	.001800	.000050	.....	.....	Elastic limit.
11,000	55,000	.004250	.002450	.....	.....	
11,200	56,000	.005000	.000750	.....	.....	
11,400	57,000	.006050	.001050	.....	.....	
11,600	58,000	.006900	.000850	.....	.....	
11,800	59,000	.007600	.000700	.....	.....	
12,000	60,000	.008600	.001000	.....	.....	
12,400	62,000	.010000	.001400	.....	.....	
12,800	64,000	.012200	.002200	.....	.....	
13,200	66,000	.014100	.001900	.....	.....	
13,600	68,000	.015900	.001800	.....	.....	
14,000	70,000	.018500	.002600	.....	.....	
14,400	72,000	.020600	.002100	.....	.....	
14,800	74,000	.022750	.002150	.....	.....	
15,200	76,000	.025300	.002550	.....	.....	
15,600	78,000	.027600	.002300	.....	.....	
16,000	80,000	.030850	.003250	.....	.....	
16,400	82,000	.034750	.003900	.....	.....	
16,800	84,000	.038600	.003850	.....	.....	
17,200	86,000	.043000	.004400	.....	.....	
17,600	88,000	.047700	.004700	.....	.....	
18,000	90,000	.055600	.007900	.....	.....	
18,400	92,000	.064500	.008900	.....	.....	
18,800	94,000	.0800	.0155	.....	.....	
19,200	96,000	.1100	.0300	.....	.....	
19,210	96,050	.1300	.0200	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	96,050
Elastic limit per square inch of original section	do....	54,000
Elongation per inch after rupture	inch..	0.1850
Elongation per inch under strain at elastic limit	do....	.001800
Reduction in diameter at point of rupture	do....	.085
Reduction in area after rupture, per centum of original section		30.7
Position of rupture		1″.15 from neck
Character of broken surface		granular, 50 per cent.; dull silky, 50 per cent.
Elongation of inch sections		″.20°, ″.17

No. 3642.

Marks, $\frac{32\ R_{34}\ T\ H}{T_6\ M}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000150	.000150	0.	.....	
2,000	10,000	.000300	.000150	0.	.....	
3,000	15,000	.000500	.000200	0.	.....	
4,000	20,000	.000650	.000150	0.	.....	
5,000	25,000	.000800	.000150	0.	.....	
6,000	30,000	.000950	.000150	0.	.....	
7,000	35,000	.001150	.000200	0.	.....	
8,000	40,000	.001300	.000150	0.	.....	
9,000	45,000	.001500	.000200	.....	.....	
10,000	50,000	.001650	.000150	.....	.....	
10,200	51,000	.001700	.000050	.....	.....	
10,400	52,000	.001750	.000050	.....	.....	Elastic limit.
10,600	53,000	.006500	.004750	.....	.....	
10,800	54,000	.007400	.000900	.....	.....	
11,000	55,000	.008250	.000850	.....	.....	
11,200	56,000	.009000	.000750	.....	.....	
11,400	57,000	.009750	.000750	.....	.....	
12,400	62,000	.015250	.005500	.....	.....	
12,800	64,000	.016500	.001250	.....	.....	
13,200	66,000	.018900	.002400	.....	.....	
13,600	68,000	.021500	.002600	.....	.....	
14,000	70,000	.024500	.003000	.....	.....	
14,400	72,000	.026250	.001750	.....	.....	
14,800	74,000	.029500	.003250	.....	.....	
15,200	76,000	.031750	.002250	.....	.....	
15,600	78,000	.036500	.004750	.....	.....	
16,000	80,000	.041750	.005250	.....	.....	
16,400	82,000	.047500	.005750	.....	.....	
16,800	84,000	.052500	.005000	.....	.....	
17,200	86,000	.058250	.005750	.....	.....	
17,600	88,000	.067000	.008750	.....	.....	
18,000	90,000	.0850	.0180	.....	.....	
18,400	92,000	.1150	.0300	.....	.....	
18,440	92,200	.1400	.0250	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	92,200
Elastic limit per square inch of original section	do....	52,000
Elongation per inch after rupture	inch..	0.2300
Elongation per inch under strain at elastic limit	do....	.001750
Reduction in diameter at point of rupture	do....	.105
Reduction in area after rupture, per centum of original section		37.1
Position of rupture		1″.05 from neck
Character of broken surface		silky
Elongation of inch sections		″.18, ″.28

No. 3506.

Marks, $\frac{32\ R_{85}\ T\ H}{T_1\ M}$

Diameter, ″.505.

Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000150	.000150	0.	.....	
2,000	10,000	.000300	.000150	0.	.....	
3,000	15,000	.000500	.000200	0.	.....	
4,000	20,000	.000650	.000150	0.	.....	
5,000	25,000	.000800	.000150	0.	.....	
6,000	30,000	.001000	.000200	0.	.....	
7,000	35,000	.001150	.000150	0.	.....	
8,000	40,000	.001350	.000200	0.	.....	
9,000	45,000	.001500	.000150	.....	.....	
9,200	46,000	.001550	.000050	.....	.....	
9,400	47,000	.001600	.000050	.....	.....	Elastic limit.
9,600	48,000	.002300	.000700	.....	.....	
9,800	49,000	.003900	.001600	.....	.....	
10,000	50,000	.004750	.000850	.....	.....	
10,200	51,000	.005500	.000750	.....	.....	
10,400	52,000	.006400	.000900	.....	.....	
10,600	53,000	.007100	.000700	.....	.....	
10,800	54,000	.007900	.000800	.....	.....	
11,000	55,000	.008500	.000600	.....	.....	
11,200	56,000	.009400	.000900	.....	.....	
11,400	57,000	.010200	.000800	.....	.....	
11,600	58,000	.011400	.001200	.....	.....	
11,800	59,000	.012300	.000900	.....	.....	
12,000	60,000	.013100	.000800	.....	.....	
12,400	62,000	.014900	.001800	.....	.....	
12,800	64,000	.017000	.002100	.....	.....	
13,200	66,000	.019000	.002000	.....	.....	
13,600	68,000	.021500	.002500	.....	.....	
14,000	70,000	.024000	.002500	.....	.....	
14,400	72,000	.026500	.002500	.....	.....	
14,800	74,000	.029500	.003000	.....	.....	
15,200	76,000	.032500	.003000	.....	.....	
15,600	78,000	.036050	.003550	.....	.....	
16,000	80,000	.040000	.003950	.....	.....	
16,400	82,000	.044900	.004900	.....	.....	
16,800	84,000	.050000	.005100	.....	.....	
17,200	86,000	.056650	.006650	.....	.....	
17,600	88,000	.0625	.005850	.....	.....	
18,000	90,000	.0800	.0175	.....	.....	
18,400	92,000	.1050	.0250	.....	.....	
18,510	92,550	.1300	.0250	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	92,550
Elastic limit per square inch of original section	do....	47,000
Elongation per inch after rupture	inch..	0.1950
Elongation per inch under strain at elastic limit	do....	.001600
Reduction in diameter at point of rupture	do....	.095
Reduction in area after rupture, per centum of original section		34.0
Position of rupture		″.85 from neck
Character of broken surface		silky, 60 per cent.; granular, 40 per cent.
Elongation of inch sections		″.28*, ″.11

No. 3507.

Marks, $\frac{32\ \text{Ea}\ \text{T}\ \text{H}}{\text{T}_2\ \text{M}}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000150	.000150	0.		
2,000	10,000	.000400	.000250	0.		
3,000	15,000	.000550	.000150	0.		
4,000	20,000	.000750	.000200	0.		
5,000	25,000	.000900	.000150	0.		
6,000	30,000	.001050	.000150	0.		
7,000	35,000	.001200	.000150	0.		
8,000	40,000	.001400	.000200	.000050	.000050	
9,000	45,000	.001600	.000200			
9,200	46,000	.001650	.000050			
9,400	47,000	.001700	.000050			
9,600	48,000	.001800	.000100			
9,800	49,000	.001850	.000050			Elastic limit.
10,000	50,000	.002200	.000350			
10,200	51,000	.003500	.001300			
10,400	52,000	.004750	.001250			
10,600	53,000	.005600	.000850			
10,800	54,000	.006400	.000800			
11,000	55,000	.007150	.000750			
11,200	56,000	.008050	.000900			
11,400	57,000	.008900	.000850			
11,600	58,000	.009900	.001000			
11,800	59,000	.010850	.000950			
12,000	60,000	.011500	.000650			
12,400	62,000	.013350	.001850			
12,800	64,000	.015200	.001850			
13,200	66,000	.017150	.001950			
13,600	68,000	.019200	.002050			
14,000	70,000	.021500	.002300			
14,400	72,000	.024000	.002500			
14,800	74,000	.026750	.002750			
15,200	76,000	.029350	.002600			
15,600	78,000	.032400	.003050			
16,000	80,000	.035600	.003200			
16,400	82,000	.039800	.004200			
16,800	84,000	.044050	.004250			
17,200	86,000	.049500	.005450			
17,600	88,000	.056250	.006750			
18,000	90,000	.0645	.008250			
18,400	92,000	.0750	.0105			
18,800	94,000	.1000	.0250			
18,920	94,600	.1350	.0350			Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds	94,600
Elastic limit per square inch of original section	do	49,000
Elongation per inch after rupture	inch	0.2700
Elongation per inch under strain at elastic limit	do	.001850
Reduction in diameter at point of rupture	do	.105
Reduction in area after rupture, per centum of original section		37.1
Position of rupture		″.60 from neck
Character of broken surface		silky
Elongation of inch sections		″.28 .14

No. 3643.

Marks, $\frac{32\ R_m\ T\ H}{T,\ M}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	.....	
2,000	10,000	.000250	.000150	0.	.....	
3,000	15,000	.000450	.000200	0.	.....	
4,000	20,000	.000600	.000150	0.	.....	
5,000	25,000	.000800	.000200	0.	.....	
6,000	30,000	.000950	.000150	0.	.....	
7,000	35,000	.001100	.000150	0.	.....	
8,000	40,000	.001256	.000150	0.	.....	
9,000	45,000	.001450	.000200	.....	.....	
10,000	50,000	.001600	.000150	.....	.....	
10,200	51,000	.001650	.000050	.....	.....	
10,400	52,000	.001700	.000050	.....	.....	
10,600	53,000	.001750	.000050	.....	.....	
10,800	54,000	.001800	.000050	.....	.....	
11,000	55,000	.001850	.000050	.....	.....	
11,200	56,000	.001950	.000100	.....	.....	Elastic limit.
11,400	57,000	.002350	.000400	.....	.....	
11,600	58,000	.003450	.001100	.....	.....	
11,800	59,000	.004250	.000800	.....	.....	
12,000	60,000	.005100	.000850	.....	.....	
12,400	62,000	.006600	.001500	.....	.....	
12,800	64,000	.008400	.001800	.....	.....	
13,200	66,000	.009750	.001350	.....	.....	
13,600	68,000	.011900	.002150	.....	.....	
14,000	70,000	.014750	.002850	.....	.....	
14,400	72,000	.017000	.002250	.....	.....	
14,800	74,000	.018750	.001750	.....	.....	
15,200	76,000	.021150	.002400	.....	.....	
15,600	78,000	.023250	.002100	.....	.....	
16,000	80,000	.025000	.001750	.....	.....	
16,400	82,000	.027500	.002500	.....	.....	
16,800	84,000	.029000	.001500	.....	.....	
17,200	86,000	.031550	.002550	.....	.....	
17,600	88,000	.035000	.003450	.....	.....	
18,000	90,000	.039500	.004500	.....	.....	
18,400	92,000	.043500	.004000	.....	.....	
18,800	94,000	.048250	.004750	.....	.....	
19,200	96,000	.054250	.006000	.....	.....	
19,600	98,000	.0600	.005750	.....	.....	
20,000	100,000	.0700	.0100	.....	.....	
20,400	102,000	.0950	.0250	.....	.....	
20,520	102,600	.1300	.0350	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	102,600
Elastic limit per square inch of original section	do....	56,000
Elongation per inch after rupture	inch..	0.2100
Elongation per inch under strain at elastic limit	do....	.001950
Reduction in diameter at point of rupture	do....	.105
Reduction in area after rupture, per centum of original section		37.1
Position of rupture		1″.10 from neck
Character of broken surface		silky
Thickness of inch sections		″.21, ″.21

No. 3644.

Marks, $\frac{32\ R_{38}\ T\ H}{T_4\ M}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000150	.000150	0.	.....	
2,000	10,000	.000300	.000150	0.	.....	
3,000	15,000	.000450	.000150	0.	.....	
4,000	20,000	.000650	.000200	0.	.....	
5,000	25,000	.000800	.000150	0.	.....	
6,000	30,000	.000950	.000150	0.	.....	
7,000	35,000	.001100	.000150	0.	.....	
8,000	40,000	.001250	.000150	0.	.....	
9,000	45,000	.001400	.000150	.....	.....	
10,000	50,000	.001550	.000150	.....	.....	
10,200	51,000	.001600	.000050	.....	.....	
10,400	52,000	.001650	.000050	.....	.....	
10,600	53,000	.001700	.000050	.....	.....	
10,800	54,000	.001800	.000100	.....	.....	Elastic limit.
11,000	55,000	.002550	.000750	.....	.....	
11,200	56,000	.003500	.000950	.....	.....	
11,400	57,000	.004100	.000600	.....	.....	
11,600	58,000	.004800	.000700	.....	.....	
11,800	59,000	.005550	.000750	.....	.....	
12,000	60,000	.006500	.000950	.....	.....	
12,400	62,000	.008050	.001550	.....	.....	
12,800	64,000	.009600	.001550	.....	.....	
13,200	66,000	.011150	.001550	.....	.....	
13,600	68,000	.013250	.002100	.....	.....	
14,000	70,000	.015650	.002400	.....	.....	
14,400	72,000	.017500	.001850	.....	.....	
14,800	74,000	.019400	.001900	.....	.....	
15,200	76,000	.021500	.002100	.....	.....	
15,600	78,000	.023500	.002000	.....	.....	
16,000	80,000	.025950	.002450	.....	.....	
16,400	82,000	.028600	.002650	.....	.....	
16,800	84,000	.032000	.003400	.....	.....	
17,200	86,000	.034750	.002750	.....	.....	
17,600	88,000	.039000	.004250	.....	.....	
18,000	90,000	.043750	.004750	.....	.....	
18,400	92,000	.049000	.005250	.....	.....	
18,800	94,000	.054000	.005000	.....	.....	
19,200	96,000	.062500	.0085	.....	.....	
19,600	98,000	.0750	.0125	.....	.....	
20,000	100,000	.1000	.0250	.....	.....	
20,080	100,150	.1100	.0100	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	100,150
Elastic limit per square inch of original section	do....	54,000
Elongation per inch after rupture	inch..	0.1000
Elongation per inch under strain at elastic limit	do....	.001800
Reduction in diameter at point of rupture	do....	.055
Reduction in area after rupture, per centum of original section		23.9
Position of rupture		1″.17 from neck
Character of surface		granular, radiating from a dull spot at the circumference
Elongation of inch sections		″.18, ″.14

No. 3557.

Marks, $\frac{32\ R_{33}\ T\ H}{T_1\ M}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	.....	
2,000	10,000	.000250	.000150	0.	.....	
3,000	15,000	.000400	.000150	0.	.....	
4,000	20,000	.000600	.000200	0.	.....	
5,000	25,000	.000800	.000200	0.	.....	
6,000	30,000	.000950	.000150	0.	.....	
7,000	35,000	.001100	.000150	0.	.....	
8,000	40,000	.001300	.000200	0.	.....	
9,000	45,000	.001500	.000200	.....	.....	
9,600	48,000	.001600	.000100	.....	.....	
9,800	49,000	.001650	.000050	.....	.....	Elastic limit.
10,000	50,000	.004800	.003150	.....	.....	
10,200	51,000	.005400	.000600	.....	.....	
10,400	52,000	.006100	.000700	.....	.....	
10,600	53,000	.006850	.000750	.....	.....	
10,800	54,000	.007600	.000750	.....	.....	
11,000	55,000	.008600	.001000	.....	.....	
11,200	56,000	.009300	.000700	.....	.....	
11,400	57,000	.010150	.000850	.....	.....	
11,600	58,000	.011000	.000850	.....	.....	
11,800	59,000	.011950	.000950	.....	.....	
12,000	60,000	.012850	.000900	.....	.....	
12,400	62,000	.014800	.001950	.....	.....	
12,800	64,000	.016600	.001800	.....	.....	
13,200	66,000	.018700	.002100	.....	.....	
13,600	68,000	.021000	.002300	.....	.....	
14,000	70,000	.023200	.002200	.....	.....	
14,400	72,000	.025900	.002700	.....	.....	
14,800	74,000	.028600	.002700	.....	.....	
15,200	76,000	.031750	.003150	.....	.....	
15,600	78,000	.035250	.003500	.....	.....	
16,000	80,000	.039000	.003750	.....	.....	
16,400	82,000	.044000	.005000	.....	.....	
16,800	84,000	.049750	.005750	.....	.....	
17,200	86,000	.055000	.005250	.....	.....	
17,600	88,000	.0625	.0075	.....	.....	
18,000	90,000	.0800	.0175	.....	.....	
18,400	92,000	.1000	.0200	.....	.....	
18,550	92,750	.1350	.0350	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	92,750
Elastic limit per square inch of original section	do....	49,000
Elongation per inch after rupture	inch..	0.2100
Elongation per inch under strain at elastic limit	do....	.001650
Reduction in diameter at point of rupture	do....	.115
Reduction in area after rupture, per centum of original section		40.3
Position of rupture		″.95 from neck
Character of broken surface		silky
Elongation of inch sections		″.27*, ″.15

No. 3558.

Marks, $\frac{32\ R_{ss}\ T\ H}{T,\ M}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	.....	
2,000	10,000	.000250	.000150	0.	.....	
3,000	15,000	.000450	.000200	0.	.....	
4,000	20,000	.000600	.000150	0.	.....	
5,000	25,000	.000800	.000200	0.	.....	
6,000	30,000	.000950	.000150	0.	.....	
7,000	35,000	.001150	.000200	0.	.....	
8,000	40,000	.001350	.000200	0.	.....	
9,000	45,000	.001500	.000150	.....	.....	
9,200	46,000	.001550	.000050	.....	.....	
9,400	47,000	.001650	.000100	.....	.....	Elastic limit.
9,600	48,000	.003000	.001350	.....	.....	
9,800	49,000	.004050	.001050	.....	.....	
10,000	50,000	.004900	.000850	.....	.....	
10,200	51,000	.005650	.000750	.....	.....	
10,400	52,000	.006350	.000700	.....	.....	
10,600	53,000	.007100	.000750	.....	.....	
10,800	54,000	.008000	.000900	.....	.....	
11,000	55,000	.008900	.000900	.....	.....	
11,200	56,000	.009800	.000900	.....	.....	
11,400	57,000	.010650	.000850	.....	.....	
11,600	58,000	.011500	.000850	.....	.....	
11,800	59,000	.012500	.001000	.....	.....	
12,000	60,000	.013500	.001000	.....	.....	
12,400	62,000	.015350	.001850	.....	.....	
12,800	64,000	.017500	.002150	.....	.....	
13,200	66,000	.019750	.002250	.....	.....	
13,600	68,000	.022300	.002550	.....	.....	
14,000	70,000	.025350	.003050	.....	.....	
14,400	72,000	.028050	.002700	.....	.....	
14,800	74,000	.030850	.002800	.....	.....	
15,200	76,000	.034000	.003150	.....	.....	
15,600	78,000	.037750	.003750	.....	.....	
16,000	80,000	.042600	.004850	.....	.....	
16,400	82,000	.048000	.005400	.....	.....	
16,800	84,000	.054250	.006250	.....	.....	
17,200	86,000	.0600	.005750	.....	.....	
17,600	88,000	.0750	.0150	.....	.....	
18,000	90,000	.1000	.0250	.....	.....	
18,080	90,400	.1200	.0200	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds	90,400
Elastic limit per square inch of original section	do	47,000
Elongation per inch after rupture	inch	0.1950
Elongation per inch under strain at elastic limit	do	.001650
Reduction in diameter at point of rupture	do	.115
Reduction in area after rupture, per centum of original section		40.3
Position of rupture		1″.05 from neck
Character of broken surface		silky
Elongation of inch sections		″.15, ″.24

No. 3599.

Marks, $\frac{32\,R_{\infty}\,T\,H}{T_3\,M}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads. Total.	Applied loads. Per square inch.	Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000150	.000150	0.	.....	
2,000	10,000	.000350	.000200	0.	.....	
3,000	15,000	.000500	.000150	0.	.....	
4,000	20,000	.000650	.000150	0.	.....	
5,000	25,000	.000850	.000200	0.	.....	
6,000	30,000	.001000	.000150	0.	.....	
7,000	35,000	.001150	.000150	0.	.....	
8,000	40,000	.001350	.000200	0.	.....	
9,000	45,000	.001500	.000150	.....	.....	
10,000	50,000	.001650	.000150	.....	.....	
10,200	51,000	.001700	.000050	.....	.....	
10,400	52,000	.001800	.000100	.....	.....	Elastic limit.
10,600	53,000	.003800	.002000	.....	.....	
10,800	54,000	.004900	.001100	.....	.....	
11,000	55,000	.005850	.000950	.....	.....	
11,200	56,000	.006800	.000950	.....	.....	
11,400	57,000	.007550	.000750	.....	.....	
11,600	58,000	.008250	.002000	.....	.....	
11,800	59,000	.009100	.000850	.....	.....	
12,000	60,000	.010050	.000950	.....	.....	
12,400	62,000	.012250	.002200	.....	.....	
12,800	64,000	.014500	.002250	.....	.....	
13,200	66,000	.016500	.002000	.....	.....	
13,600	68,000	.018100	.001600	.....	.....	
14,000	70,000	.019500	.001400	.....	.....	
14,400	72,000	.022550	.003050	.....	.....	
14,800	74,000	.024850	.002300	.....	.....	
15,200	76,000	.027550	.002700	.....	.....	
15,600	78,000	.030100	.002550	.....	.....	
16,000	80,000	.033750	.003650	.....	.....	
16,400	82,000	.037400	.003650	.....	.....	
16,800	84,000	.041550	.004150	.....	.....	
17,200	86,000	.047000	.005450	.....	.....	
17,600	88,000	.052750	.005750	.....	.....	
18,000	90,000	.060000	.007250	.....	.....	
18,400	92,000	.069800	.009800	.....	.....	
18,800	94,000	.0900	.0202	.....	.....	
19,110	95,550	.1500	.0600	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds	95,550
Elastic limit per square inch of original section	do	52,000
Elongation per inch after rupture	inch	0.2050
Elongation per inch under strain at elastic limit	do	.001800
Reduction in diameter at point of rupture	do	.105
Reduction in area after rupture, per centum of original section		37.1
Position of rupture		1″.10 from neck
Character of broken surface		granular, 60 per cent.; silky, 40 per cent.
Elongation of inch sections		″.26*, ″.15

No. 3600.

Marks, $\frac{33\ \text{Res T H}}{\text{T}_4\ \text{M}}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	.....	
2,000	10,000	.000300	.000200	0.	.....	
3,000	15,000	.000400	.000100	0.	.....	
4,000	20,000	.000550	.000150	0.	.....	
5,000	25,000	.000750	.000200	0.	.....	
6,000	30,000	.000900	.000150	0.	.....	
7,000	35,000	.001100	.000200	0.	.....	
8,000	40,000	.001250	.000150	0.	.....	
9,000	45,000	.001400	.000150	.....	.....	
10,000	50,000	.001600	.000200	.....	.....	
10,200	51,000	.001650	.000050	.....	.....	
10,400	52,000	.001700	.000050	.....	.....	
10,600	53,000	.001700	0.	.....	.....	
10,800	54,000	.001750	.000050	.....	.....	
11,000	55,000	.001800	.000050	.....	.....	
11,200	56,000	.001850	.000050	.....	.....	
11,400	57,000	.001900	.000050	.....	.....	Elastic limit.
11,600	58,000	.002100	.000200	.....	.....	
11,800	59,000	.004200	.002100	.....	.....	
12,000	60,000	.005000	.000800	.....	.....	
12,400	62,000	.007500	.002500	.....	.....	
12,800	64,000	.008900	.001400	.....	.....	
13,200	66,000	.010850	.001950	.....	.....	
13,600	68,000	.013050	.002200	.....	.....	
14,000	70,000	.015250	.002200	.....	.....	
14,400	72,000	.017500	.002250	.....	.....	
14,800	74,000	.019250	.001750	.....	.....	
15,200	76,000	.021500	.002250	.....	.....	
15,600	78,000	.024000	.002500	.....	.....	
16,000	80,000	.026800	.002800	.....	.....	
16,400	82,000	.029500	.002700	.....	.....	
16,800	84,000	.033000	.003500	.....	.....	
17,200	86,000	.036500	.003500	.....	.....	
17,600	88,000	.040750	.004250	.....	.....	
18,000	90,000	.046000	.005250	.....	.....	
18,400	92,000	.051750	.005750	.....	.....	
18,800	94,000	.0600	.008250	.....	.....	
19,200	96,000	.0700	.0100	.....	.....	
19,600	98,000	.0950	.0250	.....	.....	
19,680	98,400	.1150	.0200	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	98,400
Elastic limit per square inch of original section	do....	57,000
Elongation per inch after rupture	inch..	0.1200
Elongation per inch under strain at elastic limit	do....	.001900
Reduction in diameter at point of rupture	do....	.085
Reduction in area after rupture, per centum of original section		34.0
Position of rupture		″.85 from neck
Character of broken surface		silky, 40 per cent.; granular, 60 per cent.
Elongation of inch sections		″.25°, ″.11

No. 3568.

Marks, $\frac{32\ R_{\infty}\ T\ H}{T_1\ M}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000150	.000150	0.	.....	
2,000	10,000	.000300	.000150	0.	.....	
3,000	15,000	.000450	.000150	0.	.....	
4,000	20,000	.000700	.000250	0.	.....	
5,000	25,000	.000850	.000150	0.	.....	
6,000	30,000	.001000	.000150	0.	.....	
7,000	35,000	.001200	.000200	0.	.....	
8,000	40,000	.001350	.000150	0.	.....	
9,000	45,000	.001500	.000150	.....	.....	
9,200	46,000	.001500	0.	.....	.....	
9,400	47,000	.001550	.000050	.....	.....	
9,600	48,000	.001650	.000100	.....	.....	
9,800	49,000	.001700	.000050	.....	.....	
10,000	50,000	.001700	0.	.....	.....	
10,200	51,000	.001750	.000050	.....	.....	
10,400	52,000	.001800	.000050	.....	.....	Elastic limit.
10,600	53,000	.006500	.004700	.....	.....	
10,800	54,000	.007000	.000500	.....	.....	
11,000	55,000	.007450	.000450	.....	.....	
11,200	56,000	.008150	.000700	.....	.....	
11,400	57,000	.009350	.001200	.....	.....	
11,600	58,000	.010000	.000650	.....	.....	
11,800	59,000	.010850	.000850	.....	.....	
12,000	60,000	.011650	.000800	.....	.....	
12,400	62,000	.013750	.002100	.....	.....	
12,800	64,000	.015750	.002000	.....	.....	
13,200	66,000	.017750	.002000	.....	.....	
13,600	68,000	.020000	.002250	.....	.....	
14,000	70,000	.022150	.002150	.....	.....	
14,400	72,000	.025000	.002850	.....	.....	
14,800	74,000	.027300	.002300	.....	.....	
15,200	76,000	.030250	.002950	.....	.....	
15,600	78,000	.034000	.003750	.....	.....	
16,000	80,000	.037600	.003600	.....	.....	
16,400	82,000	.042000	.004400	.....	.....	
16,800	84,000	.047000	.005000	.....	.....	
17,200	86,000	.052250	.005250	.....	.....	
17,600	88,000	.060400	.008150	.....	.....	
18,000	90,000	.0650	.0046	.....	.....	
18,400	92,000	.0800	.0150	.....	.....	
18,800	94,000	.1200	.0400	.....	.....	
18,840	94,200	.1500	.0300	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	94,200
Elastic limit per square inch of original section	do....	52,000
Elongation per inch after rupture	inch..	0.2150
Elongation per inch under strain at elastic limit	do....	.001800
Reduction in diameter at point of rupture	do....	.125
Reduction in area after rupture, per centum of original section		43.3
Position of rupture		1″ from neck
Character of broken surface		silky
[illegible] of inch sections		″.17, ″.26*

No. 3569.

Marks, $\frac{32\ Rw\ T\ H}{T_2\ M}$
Diameter, ".505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000150	.000150	0.		
2,000	10,000	.000300	.000150	0.		
3,000	15,000	.000500	.000200	0.		
4,000	20,000	.000650	.000150	0.		
5,000	25,000	.000850	.000200	0.		
6,000	30,000	.001000	.000150	0.		
7,000	35,000	.001200	.000200	0.		
8,000	40,000	.001400	.000200	0.		
8,600	43,000	.001550	.000150			
9,200	46,000	.001600	.000050			
9,400	47,000	.001600	0.			
9,600	48,000	.001650	.000050			
9,800	49,000	.001700	.000050			
10,000	50,000	.001800	.000100			Elastic limit.
10,200	51,000	.006500	.004700			
10,400	52,000	.007000	.000500			
10,600	53,000	.007600	.000600			
10,800	54,000	.008400	.000800			
11,000	55,000	.009250	.000850			
11,200	56,000	.010100	.000850			
11,400	57,000	.011000	.000900			
11,600	58,000	.011900	.000900			
11,800	59,000	.012850	.000950			
12,000	60,000	.014350	.001500			
12,400	62,000	.015750	.001400			
12,800	64,000	.017900	.002150			
13,200	66,000	.020000	.002100			
13,600	68,000	.022250	.002250			
14,000	70,000	.024800	.002550			
14,400	72,000	.027500	.002700			
14,800	74,000	.030500	.003000			
15,200	76,000	.034000	.003500			
15,600	78,000	.037500	.003500			
16,000	80,000	.041400	.003900			
16,400	82,000	.046500	.005100			
16,800	84,000	.052250	.005750			
17,200	86,000	.059250	.007000			
17,600	88,000	.068500	.009250			
18,000	90,000	.0850	.0165			
18,400	92,000	.1050	.0200			
18,490	92,450	.1400	.0350			Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	92,450
Elastic limit per square inch of original section	do....	50,000
Elongation per inch after rupture	inch..	0.2450
Elongation per inch under strain at elastic limit	do....	.001800
Reduction in diameter at point of rupture	do....	.125
Reduction in area after rupture, per centum of original section		43.2
Position of rupture		".65 from neck
Character of broken surface		silky
Elongation of inch sections		".18, ".31

No. 3578.

Marks, $\frac{32\ R_{28}\ T\ H}{T_1\ M}$
Diameter, ".505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	.....	
2,000	10,000	.000300	.000200	0.	.....	
3,000	15,000	.000500	.000200	0.	.....	
4,000	20,000	.000650	.000150	0.	.....	
5,000	25,000	.000850	.000200	0.	.....	
6,000	30,000	.001000	.000150	0.	.....	
7,000	35,000	.001150	.000150	0.	.....	
8,000	40,000	.001350	.000200	.000050	.000050	
9,000	45,000	.001500	.000150	.....	.....	
10,000	50,000	.001650	.000150	.....	.....	
10,200	51,000	.001700	.000050	.....	.....	
10,400	52,000	.001800	.000100	.....	.....	
10,600	53,000	.001900	.000100	.....	.....	Elastic limit.
10,800	54,000	.002350	.000450	.....	.....	
11,000	55,000	.003200	.000850	.....	.....	
11,200	56,000	.004250	.001050	.....	.....	
11,400	57,000	.005200	.000950	.....	.....	
11,600	58,000	.006150	.000950	.....	.....	
11,800	59,000	.007000	.000850	.....	.....	
12,000	60,000	.007750	.000750	.....	.....	
12,400	62,000	.009300	.001550	.....	.....	
12,800	64,000	.010750	.001450	.....	.....	
13,200	66,000	.012550	.001800	.....	.....	
13,600	68,000	.014250	.001700	.....	.....	
14,000	70,000	.016100	.001850	.....	.....	
14,400	72,000	.018150	.002050	.....	.....	
14,800	74,000	.020100	.001950	.....	.....	
15,200	76,000	.022100	.002000	.....	.....	
15,600	78,000	.024750	.002650	.....	.....	
16,000	80,000	.026800	.002050	.....	.....	
16,400	82,000	.029900	.003100	.....	.....	
16,800	84,000	.033150	.003250	.....	.....	
17,200	86,000	.036550	.003400	.....	.....	
17,600	88,000	.040550	.004000	.....	.....	
18,000	90,000	.045000	.004450	.....	.....	
18,400	92,000	.051000	.006000	.....	.....	
18,800	94,000	.058500	.0075	.....	.....	
19,200	96,000	.0700	.0115	.....	.....	
19,600	98,000	.0900	.0200	.....	.....	
19,870	99,350	.1300	.0400	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	99,350
Elastic limit per square inch of original section	do....	53,000
Elongation per inch after rupture	inch..	0.1950
Elongation per inch under strain at elastic limit	do....	.001900
Reduction in diameter at point of rupture	do....	.085
Reduction in area after rupture, per centum of original section		30.7
Position of rupture		1".05 from neck
Character of broken surface		granular; dull spot at the circumference
Elongation of inch sections		".18, ".21*

No. 3579.

Marks, $\frac{32\ R_2\ T\ H}{T_2\ M}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000150	.000150	0.	.....	
2,000	10,000	.000300	.000150	0.	.....	
3,000	15,000	.000450	.000150	0.	.....	
4,000	20,000	.000650	.000200	0.	.....	
5,000	25,000	.000800	.000150	0.	.....	
6,000	30,000	.001000	.000200	0.	.....	
7,000	35,000	.001200	.000200	0.	.....	
8,000	40,000	.001350	.000150	0.	.....	
9,000	45,000	.001550	.000200	.....	.....	
10,000	50,000	.001700	.000150	.....	.....	
10,200	51,000	.001750	.000050	.....	.....	
10,400	52,000	.001800	.000050	.....	.....	
10,600	53,000	.001850	.000050	.....	.....	Elastic limit.
10,800	54,000	.002000	.000150	.....	.....	
11,000	55,000	.002850	.000850	.....	.....	
11,200	56,000	.004000	.001150	.....	.....	
11,400	57,000	.005000	.001000	.....	.....	
11,600	58,000	.005900	.000900	.....	.....	
11,800	59,000	.007000	.001100	.....	.....	
12,000	60,000	.008000	.001000	.....	.....	
12,400	62,000	.009750	.001750	.....	.....	
12,800	64,000	.011200	.001450	.....	.....	
13,200	66,000	.022900	.001700	.....	.....	
13,600	68,000	.014500	.001600	.....	.....	
14,000	70,000	.016300	.001800	.....	.....	
14,400	72,000	.018300	.002000	.....	.....	
14,800	74,000	.020350	.002050	.....	.....	
15,200	76,000	.022500	.002150	.....	.....	
15,600	78,000	.025100	.002600	.....	.....	
16,000	80,000	.027400	.002300	.....	.....	
16,400	82,000	.030100	.002700	.....	.....	
16,800	84,000	.033500	.003400	.....	.....	
17,200	86,000	.037250	.003750	.....	.....	
17,600	88,000	.040850	.003600	.....	.....	
18,000	90,000	.045500	.004650	.....	.....	
18,400	92,000	.052500	.007000	.....	.....	
18,800	94,000	.059750	.007250	.....	.....	
19,200	96,000	.0650	.005250	.....	.....	
19,600	98,000	.0900	.0250	.....	.....	
19,920	99,600	.1400	.0500	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	99,600
Elastic limit per square inch of original section	do....	53,000
Elongation per inch after rupture	inch..	0.1850
Elongation per inch under strain at elastic limit	do....	.001550
Reduction in diameter at point of rupture	do....	.075
Reduction in area after rupture, per centum of original section		27.4
Position of rupture		″.90 from neck
Character of broken surface, granular; dull spot at the circumference. Opened cracks in surface of stem.		
Elongation of inch sections		″.15, ″.22*

No. 3559.

Marks, $\frac{22\ R_0\ T\ H}{T_1\ M}$
Diameter, ".505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000150	.000150	0.	.....	
2,000	10,000	.000300	.000150	0.	.....	
3,000	15,000	.000500	.000200	0.	.....	
4,000	20,000	.000700	.000200	0.	.....	
5,000	25,000	.000850	.000150	0.	.....	
6,000	30,000	.001000	.000150	0.	.....	
7,000	35,000	.001200	.000200	0.	.....	
8,000	40,000	.001350	.000150	0.	.....	
9,000	45,000	.001500	.000150	.....	.....	
9,200	46,000	.001550	.000050	.....	.....	
9,400	47,000	.001600	.000050	.....	.....	
9,600	48,000	.001650	.000050	.....	.....	
9,800	49,000	.001800	.000150	.....	.....	
10,000	50,000	.001850	.000050	.....	.....	Elastic limit.
10,200	51,000	.002100	.000250	.....	.....	
10,400	52,000	.002800	.000700	.....	.....	
10,600	53,000	.003250	.000450	.....	.....	
10,800	54,000	.003850	.000600	.....	.....	
11,000	55,000	.004500	.000650	.....	.....	
11,200	56,000	.005150	.000650	.....	.....	
11,400	57,000	.005800	.000650	.....	.....	
11,600	58,000	.006550	.000750	.....	.....	
11,800	59,000	.007500	.000950	.....	.....	
12,000	60,000	.008350	.000850	.....	.....	
12,400	62,000	.009900	.001550	.....	.....	
12,800	64,000	.011650	.001750	.....	.....	
13,200	66,000	.013500	.001850	.....	.....	
13,600	68,000	.015100	.001600	.....	.....	
14,000	70,000	.017000	.001900	.....	.....	
14,400	72,000	.018900	.001900	.....	.....	
14,800	74,000	.021000	.002100	.....	.....	
15,200	76,000	.023050	.002050	.....	.....	
15,600	78,000	.025600	.002550	.....	.....	
16,000	80,000	.028350	.002750	.....	.....	
16,400	82,000	.031050	.002700	.....	.....	
16,800	84,000	.034100	.003050	.....	.....	
17,200	86,000	.037600	.003500	.....	.....	
17,600	88,000	.042050	.004450	.....	.....	
18,000	90,000	.046500	.004450	.....	.....	
18,400	92,000	.052500	.006000	.....	.....	
18,800	94,000	.0605	.0080	.....	.....	
19,200	96,000	.0700	.0095	.....	.....	
19,600	98,000	.0850	.0150	.....	.....	
19,920	99,600	.1200	.0350	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	99,600
Elastic limit per square inch of original section	do....	50,000
Elongation per inch after rupture	inch..	0.2100
Elongation per inch under strain at elastic limit	do....	.001850
Reduction in diameter at point of rupture	do....	.105
Reduction in area after rupture, per centum of original section		37.1
Position of rupture		".65 from neck
Character of broken surface		silky
Elongation of inch sections		".15, ".27"

No. 3560.

Marks, $\frac{32\ \text{Rm T H}}{\text{T, M}}$
Diameter, ".505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	.....	
2,000	10,000	.000300	.000200	0.	.....	
3,000	15,000	.000450	.000150	0.	.....	
4,000	20,000	.000650	.000200	0.	.....	
5,000	25,000	.000800	.000150	0.	.....	
6,000	30,000	.000950	.000150	0.	.....	
7,000	35,000	.001150	.000200	0.	.....	
8,000	40,000	.001350	.000200	0.	.....	
9,000	45,000	.001500	.000150	.....	.....	
9,200	46,000	.001550	.000050	.....	.....	
9,400	47,000	.001600	.000050	.....	.....	
9,600	48,000	.001650	.000050	.....	.....	
9,800	49,000	.001700	.000050	.....	.....	
10,000	50,000	.001750	.000050	.....	.....	
10,200	51,000	.001850	.000100	.....	.....	Elastic limit.
10,400	52,000	.002500	.000650	.....	.....	
10,600	53,000	.003000	.000500	.....	.....	
10,800	54,000	.003750	.000750	.....	.....	
11,000	55,000	.004350	.000600	.....	.....	
11,200	56,000	.005100	.000750	.....	.....	
11,400	57,000	.005600	.000500	.....	.....	
11,600	58,000	.006350	.000750	.....	.....	
11,800	59,000	.007100	.000750	.....	.....	
12,000	60,000	.008350	.001250	.....	.....	
12,400	62,000	.009500	.001150	.....	.....	
12,800	64,000	.011500	.002000	.....	.....	
13,200	66,000	.013500	.002000	.....	.....	
13,600	68,000	.015250	.001750	.....	.....	
14,000	70,000	.017000	.001750	.....	.....	
14,400	72,000	.018600	.001600	.....	.....	
14,800	74,000	.020200	.001600	.....	.....	
15,200	76,000	.022550	.002350	.....	.....	
15,600	78,000	.025250	.002700	.....	.....	
16,000	80,000	.027650	.002400	.....	.....	
16,400	82,000	.030500	.002850	.....	.....	
16,800	84,000	.033400	.002900	.....	.....	
17,200	86,000	.036600	.003200	.....	.....	
17,600	88,000	.040500	.003900	.....	.....	
18,000	90,000	.044750	.004250	.....	.....	
18,400	92,000	.051500	.006750	.....	.....	
18,800	94,000	.057750	.006250	.....	.....	
19,200	96,000	.0625	.004750	.....	.....	
19,600	98,000	.0800	.0175	.....	.....	
19,960	99,800	.1150	.0350	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	99,800
Elastic limit per square inch of original section	do....	51,000
Elongation per inch after rupture	inch..	0.1850
Elongation per inch under strain at elastic limit	do....	.001850
Reduction in diameter at point of rupture	do....	.095
Reduction in area after rupture, per centum of original section		34.0
Position of rupture		1" from neck
Character of broken surface		silky; trace of granulation
Elongation of inch sections		".14, ".23*

No. 3404.

Marks, $\frac{32\ R_u\ T\ H}{T,\ M}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	.....	
2,000	10,000	.000250	.000150	0.	.....	
3,000	15,000	.000400	.000150	0.	.....	
4,000	20,000	.000600	.000200	0.	.....	
5,000	25,000	.000800	.000200	0.	.....	
6,000	30,000	.000950	.000150	0.	.....	
7,000	35,000	.001100	.000150	0.	.....	
8,000	40,000	.001250	.000150	0.	.....	
9,000	45,000	.001400	.000150	.....	.....	
10,000	50,000	.001600	.000200	.....	.....	
10,200	51,000	.001650	.000050	.....	.....	
10,400	52,000	.001700	.000050	.....	.....	
10,600	53,000	.001750	.000050	.....	.....	Elastic limit.
10,800	54,000	.001900	.000150	.....	.....	
11,000	55,000	.002100	.000200	.....	.....	
11,200	56,000	.004500	.002400	.....	.....	
11,400	57,000	.005500	.001000	.....	.....	
11,600	58,000	.006250	.000750	.....	.....	
11,800	59,000	.006800	.000550	.....	.....	
12,000	60,000	.007600	.000800	.....	.....	
12,400	62,000	.009350	.001750	.....	.....	
12,800	64,000	.011000	.001650	.....	.....	
13,200	66,000	.013000	.002000	.....	.....	
13,600	68,000	.014500	.001500	.....	.....	
14,000	70,000	.016300	.001800	.....	.....	
14,400	72,000	.018550	.002250	.....	.....	
14,800	74,000	.020350	.001800	.....	.....	
15,200	76,000	.023750	.002400	.....	.....	
15,600	78,000	.025000	.002850	.....	.....	
16,000	80,000	.027500	.002500	.....	.....	
16,400	82,000	.031250	.003750	.....	.....	
16,800	84,000	.034000	.002750	.....	.....	
17,200	86,000	.038000	.004000	.....	.....	
17,600	88,000	.041600	.003600	.....	.....	
18,000	90,000	.046050	.004450	.....	.....	
18,400	92,000	.052000	.005950	.....	.....	
18,800	94,000	.059350	.007350	.....	.....	
19,200	96,000	.0650	.005650	.....	.....	
19,600	98,000	.0950	.0300	.....	.....	
19,770	98,850	.1150	.0200	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	98,850
Elastic limit per square inch of original section	do....	53,000
Elongation per inch after rupture	inch..	0.1900
Elongation per inch under strain at elastic limit	do	.001750
Reduction in diameter at point of rupture	do....	.105
Reduction in area after rupture, per centum of original section		37.1
Position of rupture		″.75 from neck
Character of broken surface		silky
Elongation of inch sections		″.12, ″.26

No. 3405.

Marks, $\frac{32\ R_{41}\ T\ H}{T_4\ M}$
Diameter, ".505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.		
2,000	10,000	.000250	.000150	0.		
3,000	15,000	.000400	.000150	0.		
4,000	20,000	.000550	.000150	0.		
5,000	25,000	.000700	.000150	0.		
6,000	30,000	.000900	.000200	0.		
7,000	35,000	.001050	.000150	0.		
8,000	40,000	.001200	.000150	0.		
9,000	45,000	.001400	.000200			
10,000	50,000	.001600	.000200			
10,200	51,000	.001600	0.			
10,400	52,000	.001650	.000050			
10,600	53,000	.001650	0.			
10,800	54,000	.001700	.000050			Elastic limit.
11,000	55,000	.003350	.001650			
11,200	56,000	.004800	.001450			
11,400	57,000	.005650	.000850			
11,600	58,000	.006250	.000600			
11,800	59,000	.007000	.000750			
12,000	60,000	.007850	.000850			
12,400	62,000	.009400	.001550			
12,800	64,000	.011150	.001750			
13,200	66,000	.013000	.001850			
13,600	68,000	.015150	.002150			
14,000	70,000	.017250	.002100			
14,400	72,000	.019000	.001750			
14,800	74,000	.020850	.001850			
15,200	76,000	.023000	.002150			
15,600	78,000	.025250	.002250			
16,000	80,000	.028000	.002750			
16,400	82,000	.031050	.003050			
16,800	84,000	.034750	.003700			
17,200	86,000	.038900	.004150			
17,600	88,000	.042400	.003500			
18,000	90,000	.047000	.004600			
18,400	92,000	.053500	.006500			
18,800	94,000	.061750	.008250			
19,200	96,000	.0750	.013250			
19,600	98,000	.0950	.0200			
19,760	98,800	.1300	.0350			Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds	98,800
Elastic limit per square inch of original section	do	54,000
Elongation per inch after rupture	inch	0.1950
Elongation per inch under strain at elastic limit	do	.001700
Reduction in diameter at point of rupture	do	.105
Reduction in area after rupture, per centum of original section		37.1
Position of rupture		1" from neck
Character of broken surface		silky
Elongation of inch sections		".20", ".13

No. 3406.

Marks, $\frac{32\ R_{12}\ T\ H}{T_2\ M}$
Diameter, ".505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	.....	
2,000	10,000	.000250	.000150	0.	.....	
3,000	15,000	.000400	.000150	0.	.....	
4,000	20,000	.000550	.000150	0.	.....	
5,000	25,000	.000700	.000150	0.	.....	
6,000	30,000	.000850	.000150	0.	.....	
7,000	35,000	.001050	.000200	0.	.....	
8,000	40,000	.001200	.000150	0.	.....	
9,000	45,000	.001400	.000200	.....	.....	
9,600	48,000	.001500	.000100	.....	.....	
9,800	49,000	.001600	.000100	.....	.....	Elastic limit.
10,000	50,000	.002000	.001400	.....	.....	
10,200	51,000	.004100	.001100	.....	.....	
10,400	52,000	.004500	.000400	.....	.....	
10,600	53,000	.005300	.000800	.....	.....	
10,800	54,000	.006000	.000700	.....	.....	
11,000	55,000	.006800	.000800	.....	.....	
11,200	56,000	.007500	.000900	.....	.....	
11,400	57,000	.008250	.000750	.....	.....	
11,600	58,000	.009150	.000900	.....	.....	
11,800	59,000	.010150	.001000	.....	.....	
12,000	60,000	.011000	.000850	.....	.....	
12,400	62,000	.013150	.002150	.....	.....	
12,800	64,000	.015000	.001850	.....	.....	
13,200	66,000	.017000	.002000	.....	.....	
13,600	68,000	.018900	.001900	.....	.....	
14,000	70,000	.020850	.001950	.....	.....	
14,400	72,000	.023350	.002500	.....	.....	
14,800	74,000	.026000	.002650	.....	.....	
15,200	76,000	.029000	.003000	.....	.....	
15,600	78,000	.032000	.003000	.....	.....	
16,000	80,000	.035600	.003600	.....	.....	
16,400	82,000	.039850	.004250	.....	.....	
16,800	84,000	.043750	.003900	.....	.....	
17,200	86,000	.049500	.005750	.....	.....	
17,600	88,000	.056250	.006750	.....	.....	
18,000	90,000	.0650	.008750	.....	.....	
18,400	92,000	.0800	.0150	.....	.....	
18,800	94,000	.1050	.0250	.....	.....	
18,820	94,100	.1350	.0300	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds	94,100
Elastic limit per square inch of original section	do	49,000
Elongation per inch after rupture	inch	0.1500
Elongation per inch under strain at elastic limit	do	.001600
Reduction in diameter at point of rupture	do	.045
Reduction in area after rupture, per centum of original section		16.9
Position of rupture		".40 from neck
Character of broken surface		granular; dull spot at circumference
Elongation of inch sections		".13", ".12

No. 3407.

Marks, $\frac{32\ R_{43}\ T\ H}{T_4\ M}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000150	.000150	0.	.....	
2,000	10,000	.000300	.000150	0.	.....	
3,000	15,000	.000500	.000200	0.	.....	
4,000	20,000	.000650	.000150	0.	.....	
5,000	25,000	.000800	.000150	0.	.....	
6,000	30,000	.000950	.000150	0.	.....	
7,000	35,000	.001150	.000200	0.	.....	
8,000	40,000	.001300	.000150	0.	.....	
9,000	45,000	.001500	.000200	.....	.....	
9,600	48,000	.001700	.000200	.....	.....	
9,800	49,000	.001750	.000050	.....	.....	Elastic limit.
10,000	50,000	.003750	.002000	.....	.....	
10,200	51,000	.004500	.000750	.....	.....	
10,400	52,000	.005500	.001000	.....	.....	
10,600	53,000	.006350	.000850	.....	.....	
10,800	54,000	.007100	.000750	.....	.....	
11,000	55,000	.007900	.000800	.....	.....	
11,200	56,000	.008850	.000950	.....	.....	
11,400	57,000	.009500	.000650	.....	.....	
11,600	58,000	.010350	.000850	.....	.....	
11,800	59,000	.011350	.001000	.....	.....	
12,000	60,000	.012250	.000900	.....	.....	
12,400	62,000	.014000	.001750	.....	.....	
12,800	64,000	.015750	.001750	.....	.....	
13,200	66,000	.017850	.002100	.....	.....	
13,600	68,000	.020000	.002150	.....	.....	
14,000	70,000	.022400	.002400	.....	.....	
14,400	72,000	.025250	.002850	.....	.....	
14,800	74,000	.028000	.002750	.....	.....	
15,200	76,000	.031000	.003000	.....	.....	
15,600	78,000	.033750	.002750	.....	.....	
16,000	80,000	.037200	.003450	.....	.....	
16,400	82,000	.041400	.004200	.....	.....	
16,800	84,000	.046500	.005100	.....	.....	
17,200	86,000	.053000	.006500	.....	.....	
17,600	88,000	.0600	.0070	.....	.....	
18,000	90,000	.0650	.0050	.....	.....	
18,400	92,000	.0850	.0200	.....	.....	
18,730	93,650	.1200	.0350	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	93,650
Elastic limit per square inch of original section	do....	49,000
Elongation per inch after rupture	inch.,	0.1850
Elongation per inch under strain at elastic limit	do....	.001750
Reduction in diameter at point of rupture	do....	.065
Reduction in area after rupture, per centum of original section		30.7
Position of rupture		1″.10 from neck
Character of broken surface	granular, 50 per cent.; silky, 50 per cent.	
Elongation of inch sections		″.17, ″.20

No. 3561.

Marks, $\frac{32\ R_4\ T\ H}{T_2\ M}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	.....	
2,000	10,000	.000250	.000150	0.	.....	
3,000	15,000	.000400	.000150	0.	.....	
4,000	20,000	.000550	.000150	0.	.....	
5,000	25,000	.000750	.000200	0.	.....	
6,000	30,000	.000950	.000200	0.	.....	
7,000	35,000	.001100	.000150	0.	.....	
8,000	40,000	.001250	.000150	0.	.....	
9,000	45,000	.001500	.000250	.....	.....	
9,200	46,000	.001500	0.	.....	.....	
9,400	47,000	.001550	.000050	.....	.....	
9,600	48,000	.001600	.000050	.....	.....	
9,800	49,000	.001600	0.	.....	.....	
10,000	50,000	.001650	.000050	.....	.....	Elastic limit.
10,200	51,000	.003300	.001650	.....	.....	
10,400	52,000	.004700	.001400	.....	.....	
10,600	53,000	.005850	.000650	.....	.....	
10,800	54,000	.006200	.000850	.....	.....	
11,000	55,000	.007000	.000800	.....	.....	
11,200	56,000	.007850	.000850	.....	.....	
11,400	57,000	.008850	.000800	.....	.....	
11,600	58,000	.009750	.001100	.....	.....	
11,800	59,000	.010500	.000750	.....	.....	
12,000	60,000	.011300	.000800	.....	.....	
12,400	62,000	.012900	.001600	.....	.....	
12,800	64,000	.015000	.002100	.....	.....	
13,200	66,000	.016850	.001850	.....	.....	
13,600	68,000	.019000	.002150	.....	.....	
14,000	70,000	.021050	.002050	.....	.....	
14,400	72,000	.023400	.002350	.....	.....	
14,800	74,000	.026000	.002600	.....	.....	
15,200	76,000	.028750	.002750	.....	.....	
15,600	78,000	.031600	.002850	.....	.....	
16,000	80,000	.035100	.003500	.....	.....	
16,400	82,000	.038750	.003650	.....	.....	
16,800	84,000	.043600	.004850	.....	.....	
17,200	86,000	.048750	.005150	.....	.....	
17,600	88,000	.055500	.006750	.....	.....	
18,000	90,000	.0625	.0070	.....	.....	
18,400	92,000	.0750	.0125	.....	.....	
18,800	94,000	.1000	.0250	.....	.....	
18,920	94,600	.1150	.0150	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	94,600
Elastic limit per square inch of original section	do....	50,000
Elongation per inch after rupture	inch..	0.2050
Elongation per inch under strain at elastic limit	do....	.001650
Reduction in diameter at point of rupture	do....	.115
Reduction in area after rupture, per centum of original section		40.3
Position of rupture		″.80 from neck
Character of broken surface		silky
ongation of inch sections		″.29, ″.12

No. 3562.

Marks, $\frac{32\ R_{43}\ T\ H}{T_6\ M}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	.....	
2,000	10,000	.000250	.000150	0.	.....	
3,000	15,000	.000450	.000200	0.	.....	
4,000	20,000	.000600	.000150	0.	.....	
5,000	25,000	.000800	.000200	0.	.....	
6,000	30,000	.000950	.000150	0.	.....	
7,000	35,000	.001150	.000200	0.	.....	
8,000	40,000	.001300	.000150	0.	.....	
9,000	45,000	.001500	.000200	.....	.....	
9,200	46,000	.001550	.000050	.....	.....	
9,400	47,000	.001600	.000050	.....	.....	
9,600	48,000	.001650	.000050	.....	.....	
9,800	49,000	.001700	.000050	.....	.....	
10,000	50,000	.001700	0.	.....	.....	
10,200	51,000	.001800	.000100	.....	.....	
10,400	52,000	.001850	.000050	.....	.....	
10,600	53,000	.001900	.000050	.....	.....	Elastic limit.
10,800	54,000	.002650	.000750	.....	.....	
11,000	55,000	.004550	.001900	.....	.....	
11,200	56,000	.005350	.000800	.....	.....	
11,400	57,000	.006150	.000800	.....	.....	
11,600	58,000	.006900	.000750	.....	.....	
11,800	59,000	.007550	.000650	.....	.....	
12,000	60,000	.008500	.000950	.....	.....	
12,400	62,000	.009900	.001400	.....	.....	
12,800	64,000	.011600	.001700	.....	.....	
13,200	66,000	.014100	.002500	.....	.....	
13,600	68,000	.015500	.001400	.....	.....	
14,000	70,000	.017300	.001800	.....	.....	
14,400	72,000	.019500	.002200	.....	.....	
14,800	74,000	.021750	.002250	.....	.....	
15,200	76,000	.023900	.002150	.....	.....	
15,600	78,000	.026550	.002650	.....	.....	
16,000	80,000	.029100	.002550	.....	.....	
16,400	82,000	.032250	.003150	.....	.....	
16,800	84,000	.035800	.003550	.....	.....	
17,200	86,000	.039600	.003800	.....	.....	
17,600	88,000	.044050	.004450	.....	.....	
18,000	90,000	.048900	.004850	.....	.....	
18,400	92,000	.055500	.006600	.....	.....	
18,800	94,000	.0625	.0070	.....	.....	
19,200	96,000	.0850	.0225	.....	.....	
19,580	97,900	.1200	.0350	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds	97,900
Elastic limit per square inch of original section	do	53,000
Elongation per inch after rupture	inch	0.1850
Elongation per inch under strain at elastic limit	do	.001900
Reduction in diameter at point of rupture	do	.094
Reduction in area after rupture, per centum of original section		34.0
Position of rupture		1″ from neck
Character of broken surface granular, 50 per cent.; silky, 50 per cent. Opened cracks in surface of stem		
Elongation of inch sections		″.21*, ″.16

No. 3527.

Marks, $\frac{32\ R_{44}\ T\ H}{T,\ M}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000150	.000150	0.	.....	
2,000	10,000	.000300	.000150	0.	.....	
3,000	15,000	.000500	.000200	0.	.....	
4,000	20,000	.000650	.000150	0.	.....	
5,000	25,000	.000800	.000150	0.	.....	
6,000	30,000	.001000	.000200	0.	.....	
7,000	35,000	.001150	.000150	0.	.....	
8,000	40,000	.001300	.000150	0.	.....	
9,000	45,000	.001500	.000200	.....	.....	
9,200	46,000	.001600	.000100	.....	.....	Elastic limit.
9,400	47,000	.001900	.000300	.....	.....	
9,600	48,000	.004250	.002350	.....	.....	
9,800	49,000	.005250	.001000	.....	.....	
10,000	50,000	.006500	.001250	.....	.....	
10,200	51,000	.007500	.001000	.....	.....	
10,400	52,000	.008400	.000900	.....	.....	
10,600	53,000	.009000	.000600	.....	.....	
10,800	54,000	.009600	.000600	.....	.....	
11,200	56,000	.012000	.002400	.....	.....	
11,600	58,000	.014100	.002100	.....	.....	
12,000	60,000	.016900	.002800	.....	.....	
12,400	62,000	.019100	.002200	.....	.....	
12,800	64,000	.021500	.002400	.....	.....	
13,200	66,000	.024050	.002550	.....	.....	
13,600	68,000	.026400	.002350	.....	.....	
14,000	70,000	.029250	.002850	.....	.....	
14,400	72,000	.032100	.002850	.....	.....	
14,800	74,000	.035650	.003550	.....	.....	
15,200	76,000	.039700	.004050	.....	.....	
15,600	78,000	.044100	.004400	.....	.....	
16,000	80,000	.049050	.004950	.....	.....	
16,400	82,000	.055750	.006700	.....	.....	
16,800	84,000	.0650	.009250	.....	.....	
17,200	86,000	.0850	.0200	.....	.....	
17,600	88,000	.1050	.0200	.....	.....	
17,760	88,800	.1400	.0350	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	88,800
Elastic limit per square inch of original section	do....	46,000
Elongation per inch after rupture	inch..	0.2150
Elongation per inch under strain at elastic limit	do....	.001600
Reduction in diameter at point of rupture	do....	.105
Reduction in area after rupture, per centum of original section		37.1
Position of rupture		1″.10 from neck
Character of broken surface		silky
Elongation of inch sections		″.26, ″.17

No. 3528.

Marks, $\frac{32\ R_4\ T\ H}{T_2\ M}$
Diameter, ".504.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	.....	
2,000	10,000	.000250	.000150	0.	.....	
3,000	15,000	.000450	.000200	0.	.....	
4,000	20,000	.000600	.000150	0.	.....	
5,000	25,000	.000750	.000150	0.	.....	
6,000	30,000	.000900	.000150	0.	.....	
7,000	35,000	.001100	.000200	0.	.....	
8,000	40,000	.001250	.000150	0.	.....	
9,000	45,000	.001400	.000150	.....	.....	
9,200	46,000	.001450	.000050	.....	.....	
9,400	47,000	.001500	.000050	.....	.....	Elastic limit.
9,600	48,000	.001800	.000300	.....	.....	
9,800	49,000	.003000	.001200	.....	.....	
10,000	50,000	.004500	.001500	.....	.....	
10,200	51,000	.005600	.001100	.....	.....	
10,400	52,000	.006500	.000900	.....	.....	
10,600	53,000	.007400	.000900	.....	.....	
10,800	54,000	.008100	.000700	.....	.....	
11,200	56,000	.010150	.002050	.....	.....	
11,600	58,000	.012100	.001950	.....	.....	
12,000	60,000	.014100	.002000	.....	.....	
12,400	62,000	.016250	.002150	.....	.....	
12,800	64,000	.018400	.002150	.....	.....	
13,200	66,000	.020550	.002150	.....	.....	
13,600	68,000	.022900	.002350	.....	.....	
14,000	70,000	.025550	.002650	.....	.....	
14,400	72,000	.028550	.003000	.....	.....	
14,800	74,000	.032050	.003500	.....	.....	
15,200	76,000	.035500	.003450	.....	.....	
15,600	78,000	.039500	.004000	.....	.....	
16,000	80,000	.044250	.004750	.....	.....	
16,400	82,000	.051000	.006750	.....	.....	
16,800	84,000	.057300	.006300	.....	.....	
17,200	86,000	.066100	.008850	.....	.....	
17,600	88,000	.0800	.0139	.....	.....	
17,970	89,850	.1200	.0400	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	89,850
Elastic limit per square inch of original section	do....	47,000
Elongation per inch after rupture	inch..	0.1950
Elongation per inch under strain at elastic limit	do....	.001500
Reduction in diameter at point of rupture	do....	.114
Reduction in area after rupture, per centum of original section		40.3
Position of rupture		".85 from neck
Character of broken surface		silky
Elongation of inch sections		".10, ".29

No. 3637.

Marks, $\frac{32\ R_{44}\ T\ H}{T_2\ M}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	.....	
2,000	10,000	.000300	.000200	0.	.....	
3,000	15,000	.000450	.000150	0.	.....	
4,000	20,000	.000600	.000150	0.	.....	
5,000	25,000	.000800	.000200	0.	.....	
6,000	30,000	.000950	.000150	0.	.....	
7,000	35,000	.001150	.000200	0.	.....	
8,000	40,000	.001300	.000150	0.	.....	
9,000	45,000	.001500	.000200	.....	.....	
10,000	50,000	.001700	.000200	.....	.....	
10,200	51,000	.001800	.000100	.....	.....	Elastic limit.
10,400	52,000	.002350	.000550	.....	.....	
10,600	53,000	.004100	.001750	.....	.....	
10,800	54,000	.005000	.000900	.....	.....	
11,000	55,000	.005850	.000850	.....	.....	
11,200	56,000	.006650	.000800	.....	.....	
11,400	57,000	.007350	.000700	.....	.....	
11,600	58,000	.007900	.000550	.....	.....	
11,800	59,000	.008550	.000650	.....	.....	
12,000	60,000	.009500	.000950	.....	.....	
12,400	62,000	.011500	.002000	.....	.....	
12,800	64,000	.013500	.002000	.....	.....	
13,200	66,000	.016000	.002500	.....	.....	
13,600	68,000	.017900	.001900	.....	.....	
14,000	70,000	.020000	.002100	.....	.....	
14,400	72,000	.021900	.001900	.....	.....	
14,800	74,000	.024000	.002100	.....	.....	
15,200	76,000	.026750	.002750	.....	.....	
15,600	78,000	.029300	.002550	.....	.....	
16,000	80,000	.032050	.002750	.....	.....	
16,400	82,000	.035000	.002950	.....	.....	
16,800	84,000	.039250	.004250	.....	.....	
17,200	86,000	.043450	.004200	.....	.....	
17,600	88,000	.047750	.004300	.....	.....	
18,000	90,000	.053400	.005650	.....	.....	
18,400	92,000	.060750	.007350	.....	.....	
18,800	94,000	.0650	.004250	.....	.....	
19,200	96,000	.0900	.0250	.....	.....	
19,460	97,300	.1200	.0300	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	97,300
Elastic limit per square inch of original section	do....	51,000
Elongation per inch after rupture	inch..	0.1850
Elongation per inch under strain at elastic limit	do....	.001800
Reduction in diameter at point of rupture	do....	.095
Reduction in area after rupture, per centum of original section		34.0
Position of rupture		1″ from neck
Character of broken surface		granular, 40 per cent.; dull silky, 60 per cent.
Elongation of inch sections		″.13, ″.24*

No. 3638.

Marks, $\frac{82\ R_{64}\ TH}{T_4\ M}$
Diameter, ".505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	.000050	.000050	
2,000	10,000	.000250	.000150	.000050	0.	
3,000	15,000	.000400	.000150	.000050	0.	
4,000	20,000	.000600	.000200	.000050	0.	
5,000	25,000	.000750	.000150	.000050	0.	
6,000	30,000	.000900	.000150	.000050	0.	
7,000	35,000	.001050	.000150	.000050	0.	
8,000	40,000	.001250	.000200	.000050	0.	
9,000	45,000	.001450	.000200	.....	.....	
10,000	50,000	.001600	.000150	.....	.....	
10,200	51,000	.001650	.000050	.....	.....	
10,400	52,000	.001700	.000050	.....	.....	
10,600	53,000	.001750	.000050	.....	.....	
10,800	54,000	.001750	0.	.....	.....	
11,000	55,000	.001850	.000100	.....	.....	Elastic limit.
11,200	56,000	.002250	.000400	.....	.....	
11,400	57,000	.002850	.000600	.....	.....	
11,600	58,000	.004000	.001150	.....	.....	
11,800	59,000	.004800	.000800	.....	.....	
12,000	60,000	.005550	.000750	.....	.....	
12,400	62,000	.007000	.002350	.....	.....	
12,800	64,000	.010000	.002100	.....	.....	
13,200	66,000	.011900	.001900	.....	.....	
13,600	68,000	.013100	.001200	.....	.....	
14,000	70,000	.014900	.001800	.....	.....	
14,400	72,000	.017000	.002100	.....	.....	
14,800	74,000	.019250	.002250	.....	.....	
15,200	76,000	.021500	.002250	.....	.....	
15,600	78,000	.023400	.001900	.....	.....	
16,000	80,000	.025550	.002150	.....	.....	
16,400	82,000	.028750	.003200	.....	.....	
16,800	84,000	.032000	.003250	.....	.....	
17,200	86,000	.035400	.003400	.....	.....	
17,600	88,000	.038500	.003100	.....	.....	
18,000	90,000	.042400	.003900	.....	.....	
18,400	92,000	.048000	.005600	.....	.....	
18,800	94,000	.053500	.005500	.....	.....	
19,200	96,000	.059500	.006000	.....	.....	
19,600	98,000	.071250	.011750	.....	.....	
20,000	100,000	.0950	.023750	.....	.....	
20,090	100,450	.1150	.0200	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	100,495
Elastic limit per square inch of original section	do....	55,000
Elongation per inch after rupture	inch..	0.1700
Elongation per inch under strain at elastic limit	do....	.001850
Reduction in diameter at point of rupture	do....	.095
Reduction in area after rupture, per centum of original section		34.0
Position of rupture		".60 from neck
Character of broken surface		granular, with dull silky center
Elongation of inch sections		".05, ".25"

No. 3424.

Marks, $\frac{32 R_{45} T H}{T_1 M}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000150	.000150	0.	.....	
2,000	10,000	.000350	.000200	0.	.....	
3,000	15,000	.000500	.000150	0.	.....	
4,000	20,000	.000700	.000200	0.	.....	
5,000	25,000	.000850	.000150	0.	.....	
6,000	30,000	.001000	.000150	0.	.....	
7,000	35,000	.001200	.000200	0.	.....	
8,000	40,000	.001400	.000200	0.	.....	
8,200	41,000	.001450	.000050	.....	.....	
8,400	42,000	.001450	.0	.....	.....	
8,600	43,000	.001500	.000050	.....	.....	
8,800	44,000	.001550	.000050	.....	.....	Elastic limit.
9,000	45,000	.001750	.000200	.....	.....	
9,200	46,000	.002100	.000350	.....	.....	
9,400	47,000	.004000	.001900	.....	.....	
9,600	48,000	.005000	.001000	.....	.....	
9,800	49,000	.005850	.000850	.....	.....	
10,000	50,000	.006500	.000650	.....	.....	
10,200	51,000	.007250	.000750	.....	.....	
10,400	52,000	.007900	.000650	.....	.....	
10,600	53,000	.008750	.000850	.....	.....	
10,800	54,000	.009400	.000650	.....	.....	
11,000	55,000	.010250	.000850	.....	.....	
11,200	56,000	.011000	.000750	.....	.....	
11,400	57,000	.012000	.001000	.....	.....	
11,600	58,000	.013100	.001100	.....	.....	
11,800	59,000	.013900	.000800	.....	.....	
12,000	60,000	.014700	.000800	.....	.....	
12,400	62,000	.016400	.001700	.....	.....	
12,800	64,000	.018400	.002000	.....	.....	
13,200	66,000	.020600	.002200	.....	.....	
13,600	68,000	.022850	.002250	.....	.....	
14,000	70,000	.025500	.002650	.....	.....	
14,400	72,000	.028200	.002700	.....	.....	
14,800	74,000	.031000	.002800	.....	.....	
15,200	76,000	.034100	.003100	.....	.....	
15,600	78,000	.037750	.003650	.....	.....	
16,000	80,000	.042050	.004300	.....	.....	
16,400	82,000	.047250	.005200	.....	.....	
16,800	84,000	.053500	.006250	.....	.....	
17,200	86,000	.0600	.0065	.....	.....	
17,600	88,000	.0675	.0075	.....	.....	
18,000	90,000	.0900	.0225	.....	.....	
18,360	91,800	.1350	.0450	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	91,800
Elastic limit per square inch of original section	do....	44,000
Elongation per inch after rupture	inch..	0.2200
Elongation per inch under strain at elastic limit	do....	.001550
Reduction in diameter at point of rupture	do....	.095
eduction in area after rupture, per centum of original section		34.0
osition of rupture		1″.10 from neck
aracter of broken surface		silky
ngation of inch sections		″.25*, ″.10

No. 3425.

Marks, $\frac{32\ \text{Rs T H}}{\text{T}_2\ \text{M}}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000150	.000150	0.	.....	
2,000	10,000	.000300	.000150	0.	.....	
3,000	15,000	.000500	.000200	0.	.....	
4,000	20,000	.000650	.000150	0.	.....	
5,000	25,000	.000850	.000200	0.	.....	
6,000	30,000	.001000	.000150	0.	.....	
7,000	35,000	.001200	.000200	0.	.....	
8,000	40,000	.001350	.000150	0.	.....	
8,200	41,000	.001400	.000050	.....	.....	
8,400	42,000	.001450	.000050	.....	.....	
8,600	43,000	.001500	.000050	.....	.....	
8,800	44,000	.001600	.000100	.....	.....	
9,000	45,000	.001650	.000050	.....	.....	Elastic limit.
9,200	46,000	.002500	.000850	.....	.....	
9,400	47,000	.004100	.001600	.....	.....	
9,600	48,000	.005500	.001400	.....	.....	
9,800	49,000	.006250	.000750	.....	.....	
10,000	50,000	.007000	.000750	.....	.....	
10,200	51,000	.007750	.000750	.....	.....	
10,400	52,000	.008500	.000750	.....	.....	
10,600	53,000	.009250	.000750	.....	.....	
10,800	54,000	.010000	.000750	.....	.....	
11,000	55,000	.011050	.001050	.....	.....	
11,200	56,000	.011850	.000800	.....	.....	
11,400	57,000	.012900	.001050	.....	.....	
11,600	58,000	.013750	.000850	.....	.....	
11,800	59,000	.014500	.000750	.....	.....	
12,000	60,000	.015300	.000800	.....	.....	
12,400	62,000	.017150	.001850	.....	.....	
12,800	64,000	.019250	.002100	.....	.....	
13,200	66,000	.021600	.002350	.....	.....	
13,600	68,000	.023800	.002200	.....	.....	
14,000	70,000	.026750	.002950	.....	.....	
14,400	72,000	.029750	.003000	.....	.....	
14,800	74,000	.032600	.002850	.....	.....	
15,200	76,000	.036000	.003400	.....	.....	
15,600	78,000	.039850	.003850	.....	.....	
16,000	80,000	.044500	.004650	.....	.....	
16,400	82,000	.050250	.005750	.....	.....	
16,800	84,000	.056600	.006350	.....	.....	
17,200	86,000	.0625	.0059	.....	.....	
17,600	88,000	.0800	.0175	.....	.....	
18,000	90,000	.1000	.0200	.....	.....	
18,220	91,100	.1450	.0450	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	91,100
Elastic limit per square inch of original section	do ...	45,000
Elongation per inch after rupture	inch..	0.2400
Elongation per inch under strain at elastic limit	do....	.001650
Reduction in diameter at point of rupture	do....	.105
Reduction in area after rupture, per centum of original section		37.1
Position of rupture		1″ from neck
Character of broken surface		silky
Elongation of inch sections		″.19, ″.29

No. 3542.

Marks, $\frac{32\ R_{.5}\ T\ H}{T_3\ M}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000150	.000150	0.	.....	
2,000	10,000	.000300	.000150	0.	.....	
3,000	15,000	.000450	.000150	0.	.....	
4,000	20,000	.000550	.000100	0.	.....	
5,000	25,000	.000750	.000200	0.	.....	
6,000	30,000	.000900	.000150	0.	.....	
7,000	35,000	.001050	.000150	0.	.....	
8,000	40,000	.001200	.000150	0.	.....	
9,000	45,000	.001350	.000150	.....	.....	
10,000	50,000	.001500	.000150	.....	.....	
11,000	55,000	.001700	.000200	.....	.....	
11,200	56,000	.001750	.000050	.....	.....	
11,400	57,000	.001800	.000050	.....	.....	
11,600	58,000	.001850	.000050	.....	.....	
11,800	59,000	.001900	.000050	.....	.....	
12,000	60,000	.001950	.000050	.....	.....	
12,200	61,000	.002000	.000050	.....	.....	Elastic limit.
12,400	62,000	.002350	.000350	.....	.....	
12,600	63,000	.003650	.001300	.....	.....	
12,800	64,000	.004650	.001000	.....	.....	
13,200	66,000	.006700	.002050	.....	.....	
13,600	68,000	.008500	.001800	.....	.....	
14,000	70,000	.010300	.001800	.....	.....	
14,400	72,000	.012150	.001850	.....	.....	
14,800	74,000	.014100	.001950	.....	.....	
15,200	76,000	.016000	.001900	.....	.....	
15,600	78,000	.018250	.002250	.....	.....	
16,000	80,000	.020000	.001750	.....	.....	
16,400	82,000	.022350	.002350	.....	.....	
16,800	84,000	.024850	.002500	.....	.....	
17,200	86,000	.027550	.002700	.....	.....	
17,600	88,000	.030350	.002800	.....	.....	
18,000	90,000	.033500	.003150	.....	.....	
18,400	92,000	.037000	.003500	.....	.....	
18,800	94,000	.041500	.004500	.....	.....	
19,200	96,000	.046250	.004750	.....	.....	
19,600	98,000	.051800	.005550	.....	.....	
20,000	100,000	.0575	.0057	.....	.....	
20,400	102,000	.0700	.0125	.....	.....	
20,800	104,000	.0950	.0250	.....	.....	
20,820	104,100	.1100	.0150	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	104,100
Elastic limit per square inch of original section	do....	61,000
Elongation per inch after rupture	inch..	0.1450
Elongation per inch under strain at elastic limit	do....	.002000
Reduction in diameter at point of rupture	do....	.105
Reduction in area after rupture, per centum of original section		37.1
Position of rupture		″.65 from neck
Character of broken surface		silky
Elongation of inch sections		″.11, ″.18*

No. 3543.

Marks, $\frac{32\ R_{15}\ T\ H}{T_4\ M}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000150	.000150	0.	.....	
2,000	10,000	.000300	.000150	0.	.....	
3,000	15,000	.000450	.000150	0.	.....	
4,000	20,000	.000600	.000150	0.	.....	
5,000	25,000	.000750	.000150	0.	.....	
6,000	30,000	.000950	.000200	0.	.....	
7,000	35,000	.001100	.000150	0.	.....	
8,000	40,000	.001250	.000150	0.	.....	
9,000	45,000	.001450	.000200	.....	.....	
10,000	50,000	.001650	.000200	.....	.....	
10,200	51,000	.001650	0.	.....	.....	
10,400	52,000	.001700	.000050	.....	.....	
10,600	53,000	.001750	.000050	.....	.....	
10,800	54,000	.001750	0.	.....	.....	
11,000	55,000	.001800	.000050	.....	.....	
11,200	56,000	.001850	.000050	.....	.....	
11,400	57,000	.001900	.000050	.....	.....	
11,600	58,000	.001950	.000050	.....	.....	Elastic limit.
11,800	59,000	.002150	.000200	.....	.....	
12,000	60,000	.003000	.000850	.....	.....	
12,400	62,000	.005250	.002250	.....	.....	
12,800	64,000	.007000	.001750	.....	.....	
13,200	66,000	.008600	.001600	.....	.....	
13,600	68,000	.010550	.001950	.....	.....	
14,000	70,000	.012350	.001800	.....	.....	
14,400	72,000	.014250	.001900	.....	.....	
14,800	74,000	.016250	.002000	.....	.....	
15,200	76,000	.018100	.001850	.....	.....	
15,600	78,000	.020250	.002150	.....	.....	
16,000	80,000	.022550	.002300	.....	.....	
16,400	82,000	.025200	.002650	.....	.....	
16,800	84,000	.027550	.002350	.....	.....	
17,200	86,000	.031000	.003450	.....	.....	
17,600	88,000	.033400	.002400	.....	.....	
18,000	90,000	.036750	.003350	.....	.....	
18,400	92,000	.041500	.004750	.....	.....	
18,800	94,000	.046000	.004500	.....	.....	
19,200	96,000	.051500	.005500	.....	.....	
19,600	98,000	.059500	.008000	.....	.....	
20,000	100,000	.0650	.0055	.....	.....	
20,400	102,000	.0900	.0250	.....	.....	
20,560	102,800	.1350	.0450	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	102,800
Elastic limit per square inch of original section	do....	58,000
Elongation per inch after rupture	inch..	0.2050
Elongation per inch under strain at elastic limit	do....	.001950
Reduction in diameter at point of rupture	do....	.105
Reduction in area after rupture, per centum of original section		37.1
Position of rupture		″.90 from neck
Character of broken surface		silky
Elongation of inch sections		″.28, ″.13

No. 3580.

Marks, $\frac{32\ R_{27}\ T\ H}{T_1\ M}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000150	.000150	0.	.....	
2,000	10,000	.000300	.000150	0.	.....	
3,000	15,000	.000500	.000200	0.	.....	
4,000	20,000	.000700	.000200	0.	.....	
5,000	25,000	.000850	.000150	0.	.....	
6,000	30,000	.001050	.000200	0.	.....	
7,000	35,000	.001200	.000150	0.	.....	
8,000	40,000	.001400	.000200	.000050	.000050	
9,000	45,000	.001550	.000150	.....	.....	
10,000	50,000	.001700	.000150	.....	.....	
10,200	51,000	.001750	.000050	.....	.....	Elastic limit.
10,400	52,000	.004850	.003100	.....	.....	
10,600	53,000	.006100	.001250	.....	.....	
10,800	54,000	.006650	.000550	.....	.....	
11,000	55,000	.007500	.000850	.....	.....	
11,200	56,000	.008400	.000900	.....	.....	
11,400	57,000	.009250	.000850	.....	.....	
11,600	58,000	.010050	.000800	.....	.....	
11,800	59,000	.011000	.000950	.....	.....	
12,000	60,000	.011900	.000900	.....	.....	
12,400	62,000	.013750	.001850	.....	.....	
12,800	64,000	.015850	.002100	.....	.....	
13,200	66,000	.017900	.002050	.....	.....	
13,600	68,000	.020000	.002100	.....	.....	
14,000	70,000	.022250	.002250	.....	.....	
14,400	72,000	.024250	.002000	.....	.....	
14,800	74,000	.027350	.003100	.....	.....	
15,200	76,000	.030150	.002800	.....	.....	
15,600	78,000	.033500	.003350	.....	.....	
16,000	80,000	.037000	.003500	.....	.....	
16,400	82,000	.041600	.004600	.....	.....	
16,800	84,000	.046500	.004900	.....	.....	
17,200	86,000	.053000	.006500	.....	.....	
17,600	88,000	.060750	.007750	.....	.....	
18,000	90,000	.0650	.004250	.....	.....	
18,400	92,000	.0900	.0250	.....	.....	
18,700	93,500	.1350	.0450	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	93,500
Elastic limit per square inch of original section	do....	51,000
Elongation per inch after rupture	inch..	0.2350
Elongation per inch under strain at elastic limit	do....	.001750
Reduction in diameter at point of rupture	do....	.115
Reduction in area after rupture, per centum of original section		40.3
Position of rupture		″.95 from neck
Character of broken surface		silky
Elongation of inch sections		″.29*, ″.18

No. 3581.

Marks, $\frac{82\ R_e\ T\ H}{T,\ M}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000150	.000150	0.	.....	
2,000	10,000	.000300	.000150	0.	.....	
3,000	15,000	.000450	.000150	0.	.....	
4,000	20,000	.000650	.000200	0.	.....	
5,000	25,000	.000800	.000150	0.	.....	
6,000	30,000	.001000	.000200	0.	.....	
7,000	35,000	.001200	.000200	0.	.....	
8,000	40,000	.001350	.000150	0.	.....	
9,000	45,000	.001500	.000150	.....	.....	
10,000	50,000	.001700	.000200	.....	.....	Elastic limit.
10,200	51,000	.002500	.000800	.....	.....	
10,400	52,000	.004050	.001550	.....	.....	
10,600	53,000	.005000	.000950	.....	.....	
10,800	54,000	.005850	.000850	.....	.....	
11,000	55,000	.006600	.000750	.....	.....	
11,200	56,000	.007400	.000800	.....	.....	
11,400	57,000	.008200	.000800	.....	.....	
11,600	58,000	.009100	.000900	.....	.....	
11,800	59,000	.010000	.000900	.....	.....	
12,000	60,000	.011050	.001050	.....	.....	
12,400	62,000	.012500	.001450	.....	.....	
12,800	64,000	.014250	.001750	.....	.....	
13,200	66,000	.016200	.001950	.....	.....	
13,600	68,000	.018250	.002050	.....	.....	
14,000	70,000	.020250	.002000	.....	.....	
14,400	72,000	.022800	.002550	.....	.....	
14,800	74,000	.025100	.002300	.....	.....	
15,200	76,000	.027650	.002550	.....	.....	
15,600	78,000	.030600	.002950	.....	.....	
16,000	80,000	.034000	.003400	.....	.....	
16,400	82,000	.038000	.004000	.....	.....	
16,800	84,000	.042050	.004050	.....	.....	
17,200	86,000	.047000	.004950	.....	.....	
17,600	88,000	.053250	.006250	.....	.....	
18,000	90,000	.062000	.008750	.....	.....	
18,400	92,000	.0725	.0095	.....	.....	
18,800	94,000	.1000	.0275	.....	.....	
19,000	95,000	.1350	.0350	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	95,000
Elastic limit per square inch of original section	do....	50,000
Elongation per inch after rupture	inch..	0.1350
Elongation per inch under strain at elastic limit	do....	.001700
Reduction in diameter at point of rupture	do....	.105
Reduction in area after rupture, per centum of original section		37.1
Position of rupture		″.55 from neck
Character of broken surface	silky; in part interspersed with fine granulation	
Elongation of inch sections		″.28*, '.11

No. 3570.

Marks, $\frac{32\,R_{\infty}\,T\,H}{T_1\,M}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000150	.000150	0.	.....	
2,000	10,000	.000300	.000300	0.	.....	
3,000	15,000	.000450	.000150	0.	.....	
4,000	20,000	.000600	.000150	0.	.....	
5,000	25,000	.000800	.000200	0.	.....	
6,000	30,000	.000950	.000150	0.	.....	
7,000	35,000	.001100	.000150	0.	.....	
8,000	40,000	.001300	.000200	0.	.....	
9,000	45,000	.001450	.000150	.....	.....	
9,800	49,000	.001600	.000150	.....	.....	
10,000	50,000	.001650	.000050	.....	.....	Elastic limit.
		.002700	.001050	.....	.....	
10,200	51,000	.004000	.001300	.....	.....	
10,400	52,000	.005000	.001000	.....	.....	
10,600	53,000	.005850	.000850	.....	.....	
10,800	54,000	.006600	.000750	.....	.....	
11,000	55,000	.007450	.000850	.....	.....	
11,200	56,000	.008350	.000900	.....	.....	
11,400	57,000	.009600	.001250	.....	.....	
11,600	58,000	.010100	.000500	.....	.....	
11,800	59,000	.011000	.000900	.....	.....	
12,000	60,000	.012000	.001000	.....	.....	
12,400	62,000	.013650	.001650	.....	.....	
12,800	64,000	.015750	.002100	.....	.....	
13,200	66,000	.018100	.002350	.....	.....	
13,600	68,000	.020500	.002400	.....	.....	
14,000	70,000	.022800	.002300	.....	.....	
14,400	72,000	.025550	.002750	.....	.....	
14,800	74,000	.027750	.002200	.....	.....	
15,200	76,000	.031500	.003750	.....	.....	
15,600	78,000	.034500	.003000	.....	.....	
16,000	80,000	.037900	.003400	.....	.....	
16,400	82,000	.042400	.004500	.....	.....	
16,800	84,000	.047000	.004600	.....	.....	
17,200	86,000	.053250	.006250	.....	.....	
17,600	88,000	.062000	.008750	.....	.....	
18,000	90,000	.0675	.0055	.....	.....	
18,400	92,000	.0900	.0225	.....	.....	
18,600	93,450	.1400	.0500	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	93,450
Elastic limit per square inch of original section	do....	50,000
Elongation per inch after rupture	inch..	0.2250
Elongation per inch under strain at elastic limit	do....	.001650
Reduction in diameter at point of rupture	do....	.105
Reduction in area after rupture, per centum of original section		37.1
Position of rupture		1″ from neck
Character of broken surface		silky; trace of granulation
Elongation of inch sections		″.28*, ″.17

No. 3571.

Marks, $\frac{32\ R_{16}\ T\ H}{T_2\ M}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	.....	
2,000	10,000	.000250	.000150	0.	.....	
3,000	15,000	.000400	.000150	0.	.....	
4,000	20,000	.000600	.000200	0.	.....	
5,000	25,000	.000750	.000150	0.	.....	
6,000	30,000	.000950	.000200	0.	.....	
7,000	35,000	.001100	.000150	0.	.....	
8,000	40,000	.001250	.000150	0.	.....	
9,000	45,000	.001450	.000200	.....	.....	
9,200	46,000	.001500	.000050	.....	.....	
9,400	47,000	.001550	.000050	.....	.....	Elastic limit.
9,600	48,000	.005100	.003550	.....	.....	
9,800	49,000	.005900	.000800	.....	.....	
10,000	50,000	.006500	.000600	.....	.....	
10,200	51,000	.007300	.000800	.....	.....	
10,400	52,000	.007900	.000600	.....	.....	
10,600	53,000	.008750	.000850	.....	.....	
10,800	54,000	.009500	.000750	.....	.....	
11,000	55,000	.010350	.000850	.....	.....	
11,200	56,000	.011350	.001000	.....	.....	
11,600	58,000	.013250	.001900	.....	.....	
12,000	60,000	.015150	.001900	.....	.....	
12,400	62,000	.017150	.002000	.....	.....	
12,800	64,000	.019250	.002100	.....	.....	
13,200	66,000	.021550	.002300	.....	.....	
13,600	68,000	.024000	.002450	.....	.....	
14,000	70,000	.026750	.002750	.....	.....	
14,400	72,000	.029750	.003000	.....	.....	
14,800	74,000	.032550	.002800	.....	.....	
15,200	76,000	.036150	.003600	.....	.....	
15,600	78,000	.039900	.003750	.....	.....	
16,000	80,000	.044900	.005000	.....	.....	
16,400	82,000	.050600	.005700	.....	.....	
16,800	84,000	.057500	.006900	.....	.....	
17,200	86,000	.065250	.007750	.....	.....	
17,600	88,000	.0800	.014750	.....	.....	
18,000	90,000	.1000	.0200	.....	.....	
18,160	90,800	.1450	.0450	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	90,80
Elastic limit per square inch of original section	do....	47,00
Elongation per inch after rupture	inch..	0.240
Elongation per inch under strain at elastic limit	do....	.00155
Reduction in diameter at point of rupture	do....	.11
Reduction in area after rupture, per centum of original section		40.
Position of rupture		1″.15 from nec
Character of broken surface		silk
Elongation of inch sections		″.21, ″.23

No. 3609.

Marks, $\frac{32\ R_8\ T\ H}{T_2\ M}$
Diameter, ".505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000150	.000150	0.	.....	
2,000	10,000	.000300	.000150	0.	.....	
3,000	15,000	.000450	.000150	0.	.....	
4,000	20,000	.000600	.000150	0.	.....	
5,000	25,000	.000800	.000200	0.	.....	
6,000	30,000	.000950	.000150	0.	.....	
7,000	35,000	.001100	.000150	0.	.....	
8,000	40,000	.001300	.000200	0.	.....	
9,000	45,000	.001500	.000200	.....	.....	
10,000	50,000	.001650	.000150	.....	.....	
10,200	51,000	.001750	.000100	.....	.....	Elastic limit.
10,400	52,000	.003250	.001500	.....	.....	
10,600	53,000	.004550	.001300	.....	.....	
10,800	54,000	.005300	.000750	.....	.....	
11,000	55,000	.006100	.000800	.....	.....	
11,200	56,000	.006900	.000800	.....	.....	
11,400	57,000	.007600	.000700	.....	.....	
11,600	58,000	.008350	.000750	.....	.....	
11,800	59,000	.008900	.000650	.....	.....	
12,000	60,000	.009600	.000700	.....	.....	
12,400	62,000	.011250	.001650	.....	.....	
12,800	64,000	.013050	.001800	.....	.....	
13,200	66,000	.014650	.001600	.....	.....	
13,600	68,000	.016500	.001850	.....	.....	
14,000	70,000	.018350	.001850	.....	.....	
14,400	72,000	.020750	.002400	.....	.....	
14,800	74,000	.022900	.002150	.....	.....	
15,200	76,000	.025250	.002350	.....	.....	
15,600	78,000	.027250	.002000	.....	.....	
16,000	80,000	.030500	.003250	.....	.....	
16,400	82,000	.033500	.003000	.....	.....	
16,800	84,000	.036500	.003000	.....	.....	
17,200	86,000	.039900	.003400	.....	.....	
17,600	88,000	.044750	.004850	.....	.....	
18,000	90,000	.051000	.006250	.....	.....	
18,400	92,000	.057500	.006500	.....	.....	
18,800	94,000	.065500	.008000	.....	.....	
19,200	96,000	.076250	.010750	.....	.....	
19,600	98,000	.1050	.028750	.....	.....	
19,700	98,500	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	98,500
Elastic limit per square inch of original section	do....	51,000
Elongation per inch after rupture	inch..	0.1700
Elongation per inch under strain at elastic limit	do....	.001750
Reduction in diameter at point of rupture	do....	.065
Reduction in area after rupture, per centum of original section		23.9
Position of rupture		".90 from neck
Character of broken surface		granular; dull spot at the circumference
Dimension of inch sections		".12, ".22*

No. 3610.

Marks, $\frac{32\ \text{Res T H}}{\text{T}_4\ \text{M}}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000150	.000150	0.	.....	
2,000	10,000	.000300	.000150	0.	.....	
3,000	15,000	.000500	.000200	0.	.....	
4,000	20,000	.000700	.000200	0.	.....	
5,000	25,000	.000850	.000150	0.	.....	
6,000	30,000	.001000	.000150	0.	.....	
7,000	35,000	.001200	.000200	0.	.....	
8,000	40,000	.001350	.000150	0.	.....	
9,000	45,000	.001500	.000150	.....	.....	
10,000	50,000	.001700	.000200	.....	.....	
10,200	51,000	.001750	.000050	.....	.....	
10,400	52,000	.001800	.000050	.....	.....	
10,600	53,000	.001900	.000100	.....	.....	
10,800	54,000	.001950	.000050	.....	.....	Elastic limit.
11,000	55,000	.002150	.000200	.....	.....	
11,200	56,000	.004500	.002350	.....	.....	
11,400	57,000	.005000	.000500	.....	.....	
11,600	58,000	.005850	.000850	.....	.....	
11,800	59,000	.006750	.000900	.....	.....	
12,000	60,000	.007750	.001000	.....	.....	
12,400	62,000	.009200	.001450	.....	.....	
12,800	64,000	.010550	.001350	.....	.....	
13,200	66,000	.012750	.002200	.....	.....	
13,600	68,000	.015500	.002750	.....	.....	
14,000	70,000	.017500	.002000	.....	.....	
14,400	72,000	.018700	.001200	.....	.....	
14,800	74,000	.019500	.000800	.....	.....	
15,200	76,000	.022050	.002550	.....	.....	
15,600	78,000	.025350	.003300	.....	.....	
16,000	80,000	.028250	.002900	.....	.....	
16,400	82,000	.032000	.003750	.....	.....	
16,800	84,000	.034000	.002000	.....	.....	
17,200	86,000	.037000	.003000	.....	.....	
17,600	88,000	.040150	.003150	.....	.....	
18,000	90,000	.045750	.005600	.....	.....	
18,400	92,000	.052250	.006500	.....	.....	
18,800	94,000	.058000	.005750	.....	.....	
19,200	96,000	.064500	.0065	.....	.....	
19,600	98,000	.0850	.0205	.....	.....	
20,000	100,000	.1000	.0150	.....	.....	
20,070	100,350	.1200	.0200	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	100,350
Elastic limit per square inch of original section	do....	54,000
Elongation per inch after rupture	inch..	0.2100
Elongation per inch under strain at elastic limit	do....	.001950
Reduction in diameter at point of rupture	do....	.105
Reduction in area after rupture, per centum of original section		37.1
Position of rupture		1″ from neck
Character of broken surface		silky
Elongation of inch sections		″.26, ″.16

No. 3659.

Marks, $\frac{32\ R_{48}\ T\ H}{T_5\ M}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	.....	
2,000	10,000	.000250	.000150	0.	.....	
3,000	15,000	.000450	.000200	0.	.....	
4,000	20,000	.000600	.000150	0.	.....	
5,000	25,000	.000750	.000150	0.	.....	
6,000	30,000	.000950	.000200	0.	.....	
7,000	35,000	.001150	.000200	0.	.....	
8,000	40,000	.001350	.000200	0.	.....	
9,000	45,000	.001500	.000150	.....	.....	
9,200	46,000	.001550	.000050	.....	.....	
9,400	47,000	.001550	0.	.....	.....	
9,600	48,000	.001600	.000050	.....	.....	
9,800	49,000	.001600	0.	.....	.....	
10,000	50,000	.001650	.000050	.....	.....	
10,200	51,000	.001650	0.	.....	.....	
10,400	52,000	.001700	.000050	.....	.....	Elastic limit.
10,600	53,000	.001850	.000150	.....	.....	
10,800	54,000	.002000	.000150	.....	.....	
11,000	55,000	.002500	.000500	.....	.....	
11,200	56,000	.004000	.001500	.....	.....	
11,400	57,000	.005150	.001150	.....	.....	
11,600	58,000	.006500	.001350	.....	.....	
11,800	59,000	.007350	.000850	.....	.....	
12,000	60,000	.008400	.001050	.....	.....	
12,400	62,000	.010500	.002100	.....	.....	
12,800	64,000	.012550	.002050	.....	.....	
13,200	66,000	.014550	.002000	.....	.....	
13,600	68,000	.016400	.001850	.....	.....	
14,000	70,000	.018600	.002200	.....	.....	
14,400	72,000	.021000	.002400	.....	.....	
14,800	74,000	.023500	.002500	.....	.....	
15,200	76,000	.025600	.002100	.....	.....	
15,600	78,000	.029000	.003400	.....	.....	
16,000	80,000	.032000	.003000	.....	.....	
16,400	82,000	.035250	.003250	.....	.....	
16,800	84,000	.039250	.004000	.....	.....	
17,200	86,000	.043500	.004250	.....	.....	
17,600	88,000	.049500	.0060	.....	.....	
18,000	90,000	.0571	.0076	.....	.....	
18,400	92,000	.0700	.0129	.....	.....	
18,800	94,000	.0825	.0125	.....	.....	
19,170	95,850	.1350	.0525	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	95,850
Elastic limit per square inch of original section	do....	52,000
Elongation per inch after rupture	inch..	0.2450
Elongation per inch under strain at elastic limit	do....	.001700
Reduction in diameter at point of rupture	do....	.095
Reduction in area after rupture, per centum of original section		34.0
Position of rupture		″.20 from middle of stem
Character of broken surface	granular, radiating from dull spot at the circumference	
ation of inch sections		″.26*, ″.23
1″ from place of rupture		″.39

No. 3660.

Marks, $\frac{32\ R_{18}\ T\ H}{T_6\ M}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	.....	
2,000	10,000	.000250	.000150	0.	.....	
3,000	15,000	.000400	.000150	0.	.....	
4,000	20,000	.000550	.000150	0.	.....	
5,000	25,000	.000700	.000150	0.	.....	
6,000	30,000	.000900	.000200	0.	.....	
7,000	35,000	.001050	.000150	0.	.....	
8,000	40,000	.001200	.000150	0.	.....	
9,000	45,000	.001400	.000200	.....	.....	
9,200	46,000	.001450	.000050	.....	.....	
9,400	47,000	.001450	0.	.....	.....	
9,600	48,000	.001500	.000050	.....	.....	
9,800	49,000	.001550	.000050	.....	.....	
10,000	50,000	.001550	0.	.....	.....	
10,200	51,000	.001600	.000050	.....	.....	
10,400	52,000	.001600	0.	.....	.....	
10,600	53,000	.001650	.000050	.....	.....	Elastic limit.
10,800	54,000	.002000	.000350	.....	.....	
11,000	55,000	.003250	.001250	.....	.....	
11,200	56,000	.004350	.001100	.....	.....	
11,400	57,000	.005500	.001150	.....	.....	
11,600	58,000	.006500	.001000	.....	.....	
11,800	59,000	.007300	.000800	.....	.....	
12,000	60,000	.008250	.000950	.....	.....	
12,400	62,000	.010150	.001900	.....	.....	
12,800	64,000	.012250	.002100	.....	.....	
13,200	66,000	.014250	.002000	.....	.....	
13,600	68,000	.016000	.001750	.....	.....	
14,000	70,000	.018000	.002000	.....	.....	
14,400	72,000	.020250	.002250	.....	.....	
14,800	74,000	.022750	.002500	.....	.....	
15,200	76,000	.025000	.002250	.....	.....	
15,600	78,000	.028000	.003000	.....	.....	
16,000	80,000	.030500	.002500	.....	.....	
16,400	82,000	.034150	.003650	.....	.....	
16,800	84,000	.037900	.003750	.....	.....	
17,200	86,000	.042100	.004200	.....	.....	
17,600	88,000	.047500	.005400	.....	.....	
18,000	90,000	.0550	.0075	.....	.....	
18,400	92,000	.0600	.0050	.....	.....	
18,800	94,000	.0750	.0150	.....	.....	
19,200	96,000	.1050	.0300	.....	.....	
19,280	96,400	.1300	.0250	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	96,400
Elastic limit per square inch of original section	do....	53,000
Elongation per inch after rupture	inch..	0.2300
Elongation per inch under strain at elastic limit	do....	.001650
Reduction in diameter at point of rupture	do....	.125
Reduction in area after rupture, per centum of original section		43.3
Position of rupture		1″.15 from neck
Character of broken surface		silky; trace of granu' tion
Elongation of inch sections		″.22 .24″

No. 3572.

Marks, $\frac{32\ R\ T\ H}{T,\ M}$
Diameter, ".505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000150	.000150	0.	.....	
2,000	10,000	.000300	.000150	0.	.....	
3,000	15,000	.000450	.000150	0.	.....	
4,000	20,000	.000650	.000200	0.	.....	
5,000	25,000	.000800	.000150	0.	.....	
6,000	30,000	.000950	.000150	0.	.....	
7,000	35,000	.001100	.000150	0.	.....	
8,000	40,000	.001250	.000150	0.	.....	
9,000	45,000	.001400	.000150	.....	.....	
10,000	50,000	.001600	.000200	.....	.....	
10,200	51,000	.001650	.000050	.....	.....	
10,400	52,000	.001700	.000050	.....	.....	
10,600	53,000	.001750	.000050	.....	.....	Elastic limit.
10,800	54,000	.001950	.000200	.....	.....	
11,000	55,000	.003500	.001550	.....	.....	
11,200	56,000	.004650	.001150	.....	.....	
11,400	57,000	.005650	.001000	.....	.....	
11,600	58,000	.006750	.001100	.....	.....	
11,800	59,000	.007600	.000850	.....	.....	
12,000	60,000	.008150	.000550	.....	.....	
12,400	62,000	.009750	.001600	.....	.....	
12,800	64,000	.011500	.001750	.....	.....	
13,200	66,000	.013250	.0017 0	.....	.....	
13,600	68,000	.015050	.001800	.....	.....	
14,000	70,000	.016900	.001850	.....	.....	
14,400	72,000	.019000	.002100	.....	.....	
14,800	74,000	.021050	.002050	.....	.....	
15,200	76,000	.023500	.002450	.....	.....	
15,600	78,000	.026000	.002500	.....	.....	
16,000	80,000	.028500	.002500	.....	.....	
16,400	82,000	.031500	.003000	.....	.....	
16,800	84,000	.035500	.004000	.....	.....	
17,200	86,000	.039000	.003500	.....	.....	
17,600	88,000	.043250	.004250	.....	.....	
18,000	90,000	.048250	.005000	.....	.....	
18,400	92,000	.055250	.007000	.....	.....	
18,800	94,000	.0660	.010750	.....	.....	
19,200	96,000	.0850	.0190	.....	.....	
19,600	98,000	.1050	.0200	.....	.....	
19,660	98,300	.1400	.0350	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	98,300
Elastic limit per square inch of original section	do ...	53,000
Elongation per inch after rupture	inch..	0.2350
Elongation per inch under strain at elastic limit	do.....	.001750
Reduction in diameter at point of rupture	do....	.115
Reduction in area after rupture, per centum of original section		40.3
Position of rupture		".95 from neck
Character of broken surface		silky
Elongation of inch sections		".16, ".31*

No. 3573.

Marks, $\frac{32\ R_{\infty}\ T\ H}{T_2\ M}$.
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	....	
2,000	10,000	.000250	.000150	0.	.....	
3,000	15,000	.000450	.000200	0.	.....	
4,000	20,000	.000600	.000150	0.	.....	
5,000	25,000	.000750	.000150	0.	.....	
6,000	30,000	.000900	.000150	0.	.....	
7,000	35,000	.001050	.000150	0.	.....	
8,000	40,000	.001250	.000200	0.	.....	
9,000	45,000	.001450	.000200	.....	.....	
10,000	50,000	.001600	.000150	.....	.....	
10,200	51,000	.001650	.000050	.....	.....	
10,400	52,000	.001750	.000100	.....	.....	Elastic limit.
10,600	53,000	.002050	.000300	.....	.....	
10,800	54,000	.003100	.001050	.....	.....	
11,000	55,000	.004150	.001050	.....	.....	
11,200	56,000	.005150	.001000	.....	.....	
11,400	57,000	.006100	.000950	.....	.....	
11,600	58,000	.006900	.000800	.....	.....	
11,800	59,000	.007650	.000750	.....	.....	
12,000	60,000	.008600	.000950	.....	.....	
12,400	62,000	.010000	.001400	.....	.....	
12,800	64,000	.011600	.001600	.....	.....	
13,200	66,000	.013300	.001700	.....	.....	
13,600	68,000	.015100	.001800	.....	.....	
14,000	70,000	.017050	.001950	.....	.....	
14,400	72,000	.019250	.002200	.....	.....	
14,800	74,000	.021250	.002000	.....	.....	
15,200	76,000	.023600	.002350	.....	.....	
15,600	78,000	.026000	.002400	.....	.....	
16,000	80,000	.028750	.002750	.....	.....	
16,400	82,000	.032000	.003250	.....	.....	
16,800	84,000	.035000	.003000	.....	.....	
17,200	86,000	.038750	.003750	.....	.....	
17,600	88,000	.043750	.005000	.....	.....	
18,000	90,000	.049000	.005250	.....	.....	
18,400	92,000	.057000	.008000	.....	.....	
18,800	94,000	.066250	.009250	.....	.....	
19,200	96,000	.0800	.013750	.....	.....	
19,600	98,000	.1150	.0350	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	98,000
Elastic limit per square inch of original section	do....	52,000
Elongation per inch after rupture	inch..	0.2350
Elongation per inch under strain at elastic limit	do....	.001750
Reduction in diameter at point of rupture	do....	.115
Reduction in area after rupture, per centum of original section		40.3
Position of rupture		″.95 from neck
Character of broken surface		silky
Elongation of inch sections		″.29*, ″.18

No. 3582.

Marks, $\frac{32\ Rs\ T\ H}{T,\ M}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	.....	
2,000	10,000	.000300	.000200	0.	.....	
3,000	15,000	.000500	.000200	0.	.....	
4,000	20,000	.000650	.000150	0.	.....	
5,000	25,000	.000850	.000200	0.	.....	
6,000	30,000	.001000	.000150	0.	.....	
7,000	35,000	.001200	.000200	0.	.....	
8,000	40,000	.001350	.000150	0.	.....	
9,000	45,000	.001550	.000200	.....	.....	
9,600	48,000	.001700	.000150	.....	.....	
9,800	49,000	.001750	.000050	.....	.....	Elastic limit.
10,000	50,000	.001950	.000200	.....	.....	
10,200	51,000	.002100	.000150	.....	.....	
10,400	52,000	.002300	.000200	.....	.....	
10,600	53,000	.002750	.000450	.....	.....	
10,800	54,000	.004000	.001250	.....	.....	
11,000	55,000	.005000	.001000	.....	.....	
11,200	56,000	.006100	.001100	.....	.....	
11,400	57,000	.007250	.001150	.....	.....	
11,600	58,000	.008150	.000900	.....	.....	
11,800	59,000	.009000	.000850	.....	.....	
12,000	60,000	.010000	.001000	.....	.....	
12,400	62,000	.011300	.001300	.....	.....	
12,800	64,000	.013250	.001950	.....	.....	
13,200	66,000	.015250	.002000	.....	.....	
13,600	68,000	.017300	.002050	.....	.....	
14,000	70,000	.019100	.001800	.....	.....	
14,400	72,000	.021300	.002200	.....	.....	
14,800	74,000	.023250	.001950	.....	.....	
15,200	76,000	.025650	.002400	.....	.....	
15,600	78,000	.028500	.002850	.....	.....	
16,000	80,000	.031550	.003050	.....	.....	
16,400	82,000	.035600	.004050	.....	.....	
16,800	84,000	.038800	.003200	.....	.....	
17,200	86,000	.043250	.004450	.....	.....	
17,600	88,000	.048750	.005500	.....	.....	
18,000	90,000	.055000	.006250	.....	.....	
18,400	92,000	.0650	.0100	.....	.....	
18,800	94,000	.0750	.0100	.....	.....	
19,200	96,000	.1050	.0300	.....	.....	
19,290	96,450	.1400	.0350	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	96,450
Elastic limit per square inch of original section	do....	49,000
Elongation per inch after rupture	inch..	0.2400
Elongation per inch under strain at elastic limit	do....	.001750
Reduction in diameter at point of rupture	do....	.125
Reduction in area after rupture, per centum of original section		43.3
Position of rupture		at middle of stem
Character of broken surface		silky
[illegible] of inch sections		″.24*, ″.24*

No. 3583.

Marks, $\frac{32\ R_{50}\ T\ H}{T_2\ M}$
Diameter, ″.505.
Sectional area, .20 square inch.

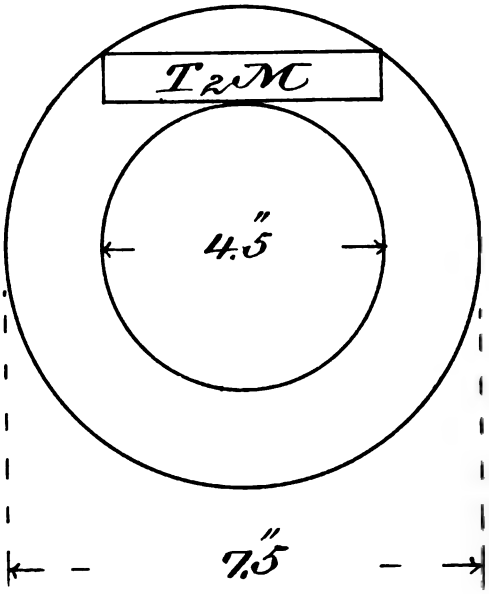
Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000150	.000150	0.	.....	
2,000	10,000	.000300	.000150	0.	.....	
3,000	15,000	.000500	.000200	0.	.....	
4,000	20,000	.000650	.000150	0.	.....	
5,000	25,000	.000800	.000150	0.	.....	
6,000	30,000	.000950	.000150	0.	.....	
7,000	35,000	.001100	.000150	0.	.....	
8,000	40,000	.001250	.000150	0.	.....	
9,000	45,000	.001400	.000150	.....	.....	
10,000	50,000	.001600	.000200	.....	.....	
10,200	51,000	.001650	.000050	.....	.....	
10,400	52,000	.001700	.000050	.....	.....	
10,600	53,000	.001800	.000100	.....	.....	
10,800	54,000	.001950	.000150	.....	.....	Elastic limit.
11,000	55,000	.002500	.000550	.....	.....	
11,200	56,000	.004000	.001500	.....	.....	
11,400	57,000	.005650	.001650	.....	.....	
11,600	58,000	.007000	.001350	.....	.....	
11,800	59,000	.008000	.001000	.....	.....	
12,000	60,000	.009000	.001000	.....	.....	
12,400	62,000	.010350	.001350	.....	.....	
12,800	64,000	.012000	.001650	.....	.....	
13,200	66,000	.013250	.001250	.....	.....	
13,600	68,000	.015500	.001250	.....	.....	
14,000	70,000	.017500	.002000	.....	.....	
14,400	72,000	.019500	.002000	.....	.....	
14,800	74,000	.022050	.002550	.....	.....	
15,200	76,000	.025100	.003050	.....	.....	
15,600	78,000	.028000	.002900	.....	.....	
16,000	80,000	.030650	.002650	.....	.....	
16,400	82,000	.033750	.003100	.....	.....	
16,800	84,000	.037000	.003250	.....	.....	
17,200	86,000	.040550	.003550	.....	.....	
17,600	88,000	.046000	.005450	.....	.....	
18,000	90,000	.052500	.006500	.....	.....	
18,400	92,000	.061500	.009000	.....	.....	
18,800	94,000	.072750	.011150	.....	.....	
19,200	96,000	.0950	.022250	.....	.....	
19,360	96,800	.1250	.0300	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	96,800
Elastic limit per square inch of original section	do....	54,000
Elongation per inch after rupture	inch..	0.2100
Elongation per inch under strain at elastic limit	do....	.001950
Reduction in diameter at point of rupture	do....	.105
Reduction in area after rupture, per centum of original section		37.1
Position of rupture		1″.05 from neck
Character of broken surface		silky, in part interspersed with granular metal
Elongation of inch sections		″.18, ″.24*

3.2 inch Steel B.L. Rifle.

Sleeves.



H Ex 45 50 2

SLEEVES.—3.2-INCH RIFLES.

No. 3590.

Marks, $\frac{32\ Rs\ S}{T_2\ M}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000150	.000150	0.	.....	
2,000	10,000	.000300	.000150	0.	.....	
3,000	15,000	.000500	.000200	0.	.....	
4,000	20,000	.000700	.000200	0.	.....	
5,000	25,000	.000850	.000150	0.	.....	
6,000	30,000	.001050	.000200	0.	.....	
7,000	35,000	.001250	.000200	0.	.....	
8,000	40,000	.001400	.000150	0.	.....	
9,000	45,000	.001550	.000150	.....	.....	
10,000	50,000	.001700	.000150	.....	.....	
10,200	51,000	.001750	.000050	.....	.....	
10,400	52,000	.001800	.000050	.....	.....	
10,600	53,000	.001850	0.	.....	.....	
10,800	54,000	.001850	.000050	.....	.....	Elastic limit.
11,000	55,000	.003450	.001600	.....	.....	
11,200	56,000	.005850	.002400	.....	.....	
11,400	57,000	.008000	.002150	.....	.....	
11,600	58,000	.009600	.001600	.....	.....	
11,800	59,000	.010500	.000900	.....	.....	
12,000	60,000	.011750	.001250	.....	.....	
12,400	62,000	.014000	.002250	.....	.....	
12,800	64,000	.016000	.002000	.....	.....	
13,200	66,000	.018000	.002000	.....	.....	
13,600	68,000	.020000	.002000	.....	.....	
14,000	70,000	.022750	.002750	.....	.....	
14,400	72,000	.025500	.002750	.....	.....	
14,800	74,000	.027900	.002400	.....	.....	
15,200	76,000	.031250	.003350	.....	.....	
15,600	78,000	.035000	.003750	.....	.....	
16,000	80,000	.039000	.004000	.....	.....	
16,400	82,000	.044250	.005250	.....	.....	
16,800	84,000	.051000	.006750	.....	.....	
17,200	86,000	.057750	.006750	.....	.....	
17,600	88,000	.0650	.007250	.....	.....	
18,000	90,000	.0900	.0250	.....	.....	
18,200	91,000	.1200	.0300	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	91,000
Elastic limit per square inch of original section	do	54,000
Elongation per inch after rupture	inch..	0.2400
Elongation per inch under strain at elastic limit	do.....	.001850
Reduction in diameter at point of rupture	do....	.165
Reduction in area after rupture, per centum of original section		54.6
Position of rupture		1″.10 from neck
Character of broken surface		silky
Elongation of inch sections		″.33*, ″.15

No. 3567.

Marks, $\frac{32\ R_{28}\ 8}{T_2\ M}$
Diameter, ".505.
Sectional area, .20 square inch.

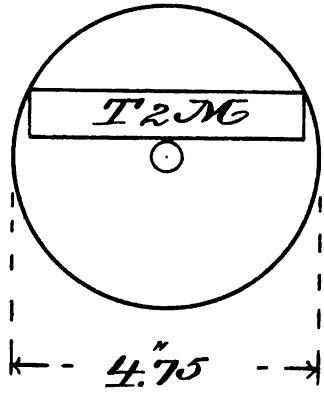
Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	.....	
2,000	10,000	.000300	.000200	0.	.....	
3,000	15,000	.000450	.000150	0.	.....	
4,000	20,000	.000600	.000150	0.	.....	
5,000	25,000	.000800	.000200	0.	.....	
6,000	30,000	.000950	.000150	0.	.....	
7,000	35,000	.001100	.000150	0.	.....	
8,000	40,000	.001300	.000200	0.	.....	
9,000	45,000	.001500	.000200	.....	.....	
10,000	50,000	.001700	.000200	.....	.....	
10,200	51,000	.001750	.000050	.....	.....	
10,400	52,000	.001800	.000050	.....	.....	
10,600	53,000	.001850	.000050	.....	.....	
10,800	54,000	.001900	.000050	.....	.....	Elastic limit.
11,000	55,000	.002150	.000250	.....	.....	
11,200	56,000	.003600	.001550	.....	.....	
11,400	57,000	.004650	.001050	.....	.....	
11,600	58,000	.005600	.0009 0	.....	.....	
11,800	59,000	.006500	.000900	.....	.....	
12,000	60,000	.007250	.000750	.....	.....	
12,400	62,000	.008650	.001400	.....	.....	
12,800	64,000	.010100	.001550	.....	.....	
13,200	66,000	.011900	.001800	.....	.....	
13,600	68,000	.013600	.001700	.....	.....	
14,000	70,000	.015350	.001750	.....	.....	
14,400	72,000	.017500	.002150	.....	.....	
14,800	74,000	.019300	.001800	.....	.....	
15,200	76,000	.021500	.002200	.....	.....	
15,600	78,000	.023650	.002150	.....	.....	
16,000	80,000	.026000	.002350	.....	.....	
16,400	82,000	.028500	.002500	.....	.....	
16,800	84,000	.031400	.002900	.....	.....	
17,200	86,000	.034900	.003500	.....	.....	
17,600	88,000	.038250	.003350	.....	.....	
18,000	90,000	.042100	.003850	.....	.....	
18,400	92,000	.047750	.005650	.....	.....	
18,800	94,000	.053400	.005650	.....	.....	
19,200	96,000	.0600	.0066	.....	.....	
19,600	98,000	.0750	.0150	.....	.....	
20,000	100,000	.1050	.0300	.....	.....	
20,050	100,250	.1250	.0200	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds	100,250
Elastic limit per square inch of original section	do	54,000
Elongation per inch after rupture	inch	0.2050
Elongation per inch under strain at elastic limit	do	.001900
Reduction in diameter at point of rupture	do	.105
Reduction in area after rupture, per centum of original section		37.1
Position of rupture		".85 from neck
Character of broken surface		silky
Elongation of inch sections		".12, ".29"

3.2 inch Steel B.L. Rifles.

Breech Blocks.



H Ex 45 50 2

No. 3411.

Marks, $\frac{32\,R_{25}\,B\,B}{T_2\,M}$
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	.....	
2,000	10,000	.000250	.000150	0.	.....	
3,000	15,000	.000400	.000150	0.	.....	
4,000	20,000	.000550	.000150	0.	.....	
5,000	25,000	.000700	.000150	0.	.....	
6,000	30,000	.000900	.000200	0.	.....	
7,000	35,000	.001050	.000150	0.	.....	
8,000	40,000	.001200	.000150	0.	.....	
9,000	45,000	.001400	.000200	.....	.....	
10,000	50,000	.001650	.000250	.....	.....	Elastic limit.
10,200	51,000	.001850	.000200	.....	.....	
10,400	52,000	.002800	.000950	.....	.....	
10,600	53,000	.003600	.000800	.....	.....	
10,800	54,000	.004500	.000900	.....	.....	
11,000	55,000	.005350	.000850	.....	.....	
11,200	56,000	.006400	.001050	.....	.....	
11,400	57,000	.007150	.000750	.....	.....	
11,600	58,000	.007850	.000700	.....	.....	
11,800	59,000	.008600	.000750	.....	.....	
12,000	60,000	.009500	.000900	.....	.....	
12,400	62,000	.011500	.002000	.....	.....	
12,800	64,000	.013000	.001500	.....	.....	
13,200	66,000	.015150	.002150	.....	.....	
13,600	68,000	.017000	.001850	.....	.....	
14,000	70,000	.019000	.002000	.....	.....	
14,400	72,000	.021250	.002250	.....	.....	
14,800	74,000	.023500	.002250	.....	.....	
15,200	76,000	.026000	.002500	.....	.....	
15,600	78,000	.028750	.002750	.....	.....	
16,000	80,000	.032250	.003500	.....	.....	
16,400	82,000	.035750	.003500	.....	.....	
16,800	84,000	.039500	.003750	.....	.....	
17,200	86,000	.044500	.005000	.....	.....	
17,600	88,000	.051250	.006750	.....	.....	
18,000	90,000	.058500	.007250	.....	.....	
18,400	92,000	.0650	.0065	.....	.....	
18,800	94,000	.0900	.0250	.....	.....	
18,970	94,850	.1300	.0400	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	94,850
Elastic limit per square inch of original section	do....	50,000
Elongation per inch after rupture	inch..	0.1900
Elongation per inch under strain at elastic limit	do....	.001650
Reduction in diameter at point of rupture	do....	.105
Reduction in area after rupture, per centum of original section		37.1
Position of rupture		″.60 from neck
Character of broken surface	silky; slightly granular at circumference	
Elongation of inch sections		″.11, ″.27*

BASE RING—3.2-INCH STEEL B. L. RIFLES.

No. 2410.

Marks, $\frac{32\ R_{21}\ B\ R}{T_2\ M}$
Diameter, ″.505.
Sectional area, .20 square inch.

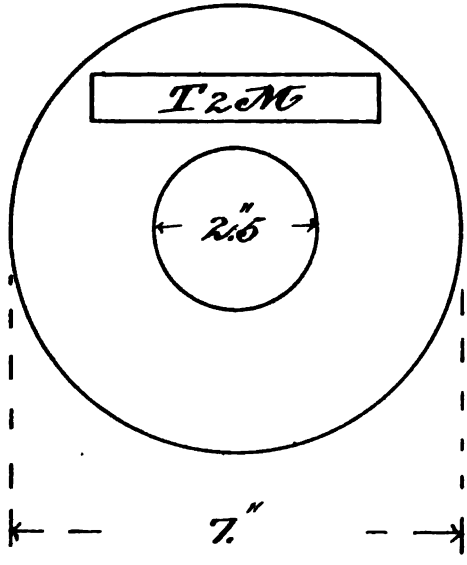
Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	.....	
2,000	10,000	.000250	.000150	0.	.....	
3,000	15,000	.000400	.000150	0.	.....	
4,000	20,000	.000550	.000150	0.	.....	
5,000	25,000	.000750	.000200	0.	.....	
6,000	30,000	.000900	.000150	0.	.....	
7,000	35,000	.001050	.000150	0.	.....	
8,000	40,000	.001300	.000250	.000050	.000050	
9,000	45,000	.001550	.000250	.....	.....	
9,200	46,000	.001600	.000050	.....	.....	
9,400	47,000	.001700	.000100	.....	.....	Elastic limit.
9,600	48,000	.002250	.000550	.....	.....	
9,800	49,000	.003900	.001650	.....	.....	
10,000	50,000	.004500	.000600	.....	.....	
10,200	51,000	.005300	.000800	.....	.....	
10,400	52,000	.006200	.000900	.....	.....	
10,600	53,000	.007000	.000800	.....	.....	
10,800	54,000	.007850	.000850	.....	.....	
11,000	55,000	.008500	.000650	.....	.....	
11,200	56,000	.009300	.000800	.....	.....	
11,400	57,000	.010150	.000850	.....	.....	
11,600	58,000	.011150	.001000	.....	.....	
11,800	59,000	.012050	.000900	.....	.....	
12,000	60,000	.013000	.000950	.....	.....	
12,400	62,000	.014600	.001600	.....	.....	
12,800	64,000	.016500	.001900	.....	.....	
13,200	66,000	.018500	.002000	.....	.....	
13,600	68,000	.020750	.002250	.....	.....	
14,000	70,000	.023000	.002250	.....	.....	
14,400	72,000	.025550	.002550	.....	.....	
14,800	74,000	.028500	.002950	.....	.....	
15,200	76,000	.031250	.002750	.....	.....	
15,600	78,000	.035000	.003750	.....	.....	
16,000	80,000	.039500	.004500	.....	.....	
16,400	82,000	.044500	.005000	.....	.....	
16,800	84,000	.049600	.005100	.....	.....	
17,200	86,000	.057500	.007900	.....	.....	
17,600	88,000	.0650	.0075	.....	.....	
18,000	90,000	.0850	.0200	.....	.....	
18,310	91,550	.1350	.0500	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	91,550
Elastic limit per square inch of original section	do....	47,000
Elongation per inch after rupture	inch..	0.2500
Elongation per inch under strain at elastic limit	do....	.001700
Reduction in diameter at point of rupture	do....	.135
Reduction in area after rupture, per centum of original section		46.2
Position of rupture		″.75 from neck
Character of broken surface		silky
Elongation of inch sections		″.35, ″.15

3.2 inch Steel B.L. Rifle.

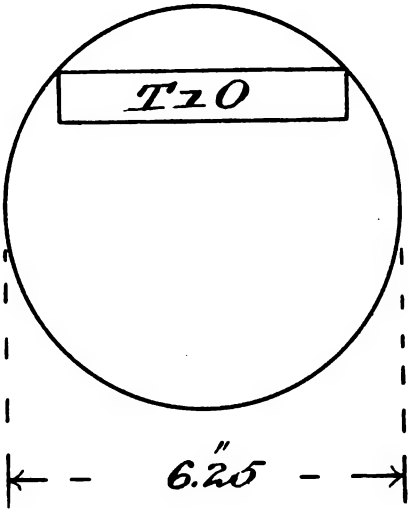
Base Rings.



H Ex 45 50 2

3.2 inch Steel B.L. Rifles

Gas Check Forging



H Ex 45 50 2

GAS CHECK FORGING—3.2-INCH STEEL B. L. RIFLES.

No. 3673.

Marks, $\frac{22\ R_2\ G\ C}{T_1\ O}$
Diameter, ".505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	.....	
2,000	10,000	.000250	.000150	0.	.....	
3,000	15,000	.000450	.000200	0.	.....	
4,000	20,000	.000600	.000150	0.	.....	
5,000	25,000	.000800	.000200	0.	.....	
6,000	30,000	.001000	.000200	0.	.....	
7,000	35,000	.001200	.000200	0.	.....	
8,000	40,000	.001400	.000200	0.	.....	
9,000	45,000	.001500	.000100	0.	.....	
10,000	50,000	.001650	.000150	0.	.....	
11,000	55,000	.001850	.000200	.....	.....	
12,000	60,000	.002050	.000200	.....	.....	
12,400	62,000	.002150	.000100	.....	.....	Elastic limit.
12,800	64,000	.002550	.000400	.....	.....	
13,200	66,000	.002800	.000250	.....	.....	
13,600	68,000	.004950	.002150	.....	.....	
14,000	70,000	.006300	.001350	.....	.....	
14,400	72,000	.007800	.001500	.....	.....	
14,800	74,000	.009150	.001350	.....	.....	
15,200	76,000	.010900	.001750	.....	.....	
15,600	78,000	.012350	.001450	.....	.....	
16,000	80,000	.014250	.001900	.....	.....	
16,400	82,000	.016000	.001750	.....	.....	
16,800	84,000	.017600	.001600	.....	.....	
17,200	86,000	.019500	.001900	.....	.....	
17,600	88,000	.021500	.002000	.....	.....	
18,000	90,000	.024250	.002750	.....	.....	
18,800	94,000	.0275	.003250	.....	.....	
19,600	98,000	.0300	.0025	.....	.....	
20,400	102,000	.0400	.0100	.....	.....	
21,200	106,000	.0500	.0100	.....	.....	
22,000	110,000	.0600	.0100	.....	.....	
22,410	112,050	.1100	.0500	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	112,050
Elastic limit per square inch of original section	do....	62,000
Elongation per inch after rupture	inch..	0.1850
Elongation per inch under strain at elastic limit	do....	.002150
Reduction in diameter at point of rupture	do....	.125
Reduction in area after rupture, per centum of original section		43.3
Position of rupture		1" from neck
Character of broken surface		silky
Elongation of inch sections		",26", ".11

No. 3682.

Marks, $\frac{32\ R_2\ G\ C}{T_2\ O}$
Diameter, ″.504.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000150	.000150	0.	.....	
2,000	10,000	.000300	.000150	0.	.....	
3,000	15,000	.000450	.000150	0.	.....	
4,000	20,000	.000650	.000200	0.	.....	
5,000	25,000	.000850	.000200	0.	.....	
6,000	30,000	.001000	.000150	0.	.....	
7,000	35,000	.001200	.000200	0.	.....	
8,000	40,000	.001350	.000150	0.	.....	
9,000	45,000	.001500	.000150	0.	.....	
10,000	50,000	.001650	.000150	0.	.....	
11,000	55,000	.001850	.000200	.....	.....	
12,000	60,000	.002000	.000150	.....	.....	
12,400	62,000	.002050	.000050	.....	.....	
12,800	64,000	.002150	.000100	.....	.....	
13,000	65,000	.002200	.000050	.....	.....	Elastic limit not well defined.
13,200	66,000	.002250	.000150	.....	.....	
13,400	67,000	.002700	.000350	.....	.....	
13,600	68,000	.003000	.000300	.....	.....	
13,800	69,000	.003150	.000150	.....	.....	
14,000	70,000	.003500	.000350	.....	.....	
14,200	71,000	.003800	.000300	.....	.....	
14,400	72,000	.004200	.000400	.....	.....	
14,800	74,000	.005050	.000850	.....	.....	
15,200	76,000	.006400	.001350	.....	.....	
15,600	78,000	.007750	.001350	.....	.....	
16,000	80,000	.009000	.001250	.....	.....	
16,400	82,000	.010400	.001400	.....	.....	
16,800	84,000	.012000	.001600	.....	.....	
17,200	86,000	.013500	.001500	.....	.....	
17,600	88,000	.015200	.001700	.....	.....	
18,000	90,000	.017000	.001800	.....	.....	
18,400	92,000	.019000	.002000	.....	.....	
18,800	94,000	.020350	.001350	.....	.....	
19,200	96,000	.022500	.002150	.....	.....	
19,600	98,000	.024500	.002000	.....	.....	
20,000	100,000	.027000	.002500	.....	.....	
20,400	102,000	.030000	.003000	.....	.....	
20,800	104,000	.032850	.002850	.....	.....	
21,200	106,000	.035850	.003000	.....	.....	
21,600	108,000	.038400	.002550	.....	.....	
22,000	110,000	.042050	.003650	.....	.....	
22,800	114,000	.0500	.007950	.....	.....	
23,600	118,000	.0800	.0300	.....	.....	
23,610	118,050	.1000	.0200	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	118,050
Elastic limit per square inch of original section, not well defined	do....	65,000
Elongation per inch after rupture	inch..	0.1300
Elongation per inch under strain at elastic limit	do....	.002200
Reduction in diameter at point of rupture	do....	.674
Reduction in area after rupture, per centum of original section		27.4
Position of rupture		at middle of stem
Character of broken surface		granular; dull silky center
Elongation of inch sections		″.13*, ″.12*

No. 3689.

Marks, $\frac{32\ Rx\ G\ C}{T_2\ O}$
Diameter ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	.....	
2,000	10,000	.000250	.000150	0.	.....	
3,000	15,000	.000400	.000150	0.	.....	
4,000	20,000	.000550	.000150	0.	.....	
5,000	25,000	.000700	.000150	0.	.....	
6,000	30,000	.000850	.000150	0.	.....	
7,000	35,000	.001050	.000200	0.	.....	
8,000	40,000	.001200	.000150	0.	.....	
9,000	45,000	.001400	.000200	0.	.....	
10,000	50,000	.001550	.000150	0.	.....	
11,000	55,000	.001700	.000150	.....	.....	
12,000	60,000	.001850	.000150	.....	.....	
12,400	62,000	.001950	.000100	.....	.....	
12,800	64,000	.002050	.000100	.....	.....	
13,200	66,000	.002100	.000050	.....	.....	
13,600	68,000	.002150	.000050	.....	.....	
14,000	70,000	.002250	.000100	.....	.....	
14,400	72,000	.002350	.000100	.....	.....	
14,800	74,000	.002500	.000150	.....	.....	
15,000	75,000	.002550	.000050	.....	.....	Elastic limit.
15,200	76,000	.002750	.000200	.....	.....	
15,600	78,000	.003250	.000500	.....	.....	
16,000	80,000	.004000	.000750	.....	.....	
16,400	82,000	.004900	.000900	.....	.....	
16,800	84,000	.005950	.001050	.....	.....	
17,200	86,000	.007100	.001150	.....	.....	
17,600	88,000	.008100	.001000	.....	.....	
18,000	90,000	.010000	.001900	.....	.....	
18,400	92,000	.011500	.001500	.....	.....	
18,800	94,000	.013000	.001500	.....	.....	
19,200	96,000	.014700	.001700	.....	.....	
19,600	98,000	.016000	.001300	.....	.....	
20,000	100,000	.018650	.002650	.....	.....	
20,400	102,000	.020400	.001750	.....	.....	
20,800	104,000	.021700	.001300	.....	.....	
21,200	106,000	.023450	.001750	.....	.....	
21,600	108,000	.025550	.002100	.....	.....	
22,000	110,000	.027750	.002200	.....	.....	
22,800	114,000	.0300	.002250	.....	.....	
23,600	118,000	.0400	.0100	.....	.....	
24,400	122,000	.0500	.0100	.....	.....	
25,200	126,000	.0650	.0150	.....	.....	
25,200	126,800	.0900	.0250	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	126,800
Elastic limit per square inch of original section	do....	75,000
Elongation per inch after rupture	inch..	0.1250
Elongation per inch under strain at elastic limit	do....	.002550
Reduction in diameter at point of rupture	do....	.065
Reduction in area after rupture, per centum of original section		23.9
Pc ion of rupture		″.65 from neck
Cl oter of broken surface		granular at circumference; silky center
El n of inch sections		″.07, ″.18*

TABULATION OF SPECIMENS FROM TUBES FOR 3".2 STEEL B. L. RIFLES.

No. of test.	Position in gun.	Location of specimens.	Elastic limit per square inch.	Tensile strength per square inch.	Elongation.	Contraction of area.	Appearance of fracture.
			Pounds.	*Pounds.*	*Per cent.*	*Per cent.*	
2498	Breech, No. 26	Middle	47,060	88,000	25.5	46.2	Silky.
2499	....do	....do	48,000	87,900	25.0	49.1	Do.
2500	Muzzle, No. 26	....do	46,000	89,150	23.0	43.3	Do.
2501	....do	....do	46,000	88,750	20.5	43.3	Do.
2490	Breech, No. 27	....do	44,000	85,600	24.5	40.3	Do.
2491	....do	....do	46,000	87,000	24.0	43.3	Do.
2492	Muzzle, No. 27	....do	47,000	89,950	18.5	20.5	Granular, dull spot.
2493	....do	....do	46,000	89,000	23.5	40.3	Granular, 40 per cent.; silky, 60 per cent.
2536	....do	....do	45,000	91,100	18.5	23.9	Granular, 60 per cent.; dull flaky, 40 per cent.
2537	....do	....do	46,000	90,650	24.0	46.2	Silky.
2555	....do	....do	46,000	90,700	26.0	43.3	Do.
2556	....do	....do	48,000	91,400	22.0	43.3	Do.
2430	Breech, No. 28	....do	45,000	89,700	23.0	43.3	Do.
2431	....do	....do	46,000	87,350	22.5	43.3	Do.
2432	Muzzle, No. 28	....do	46,000	91,100	21.0	43.3	Do.
2433	....do	....do	44,000	88,200	23.5	46.2	Do.
2551	Breech, No. 30	....do	45,000	84,100	15.0	16.9	Flaky, 60 per cent.; granular, 40 per cent.
2552	....do	....do	46,000	84,400	12.5	9.5	Granular, flaky spot.
2553	Muzzle, No. 30	....do	46,000	86,700	12.0	16.9	Do.
2554	....do	....do	43,000	81,500	9.0	13.2	Granular, 60 per cent.; flaky, 40 per cent.
2451	Breech, No. 30	....do	48,000	86,300	25.0	37.1	Silky serrated.
2452	....do	....do	47,000	85,450	27.0	49.1	Silky.
2453	Muzzle, No. 30	....do	47,000	86,900	22.5	49.1	Do.
2454	....do	....do	49,000	85,850	20.5	49.1	Do.
2617	Breech, No. 31	....do	49,000	86,050	18.0	27.4	Granular, flaky spot.
2618	....do	....do	50,000	87,400	15.0	23.9	Do.
2619	Muzzle, No. 31	....do	48,000	85,800	23.5	37.1	Silky serrated, granular spot.
2620	....do	....do	48,000	87,050	21.0	43.3	Silky.
2661	Breech, No. 31	....do	50,000	84,600	24.5	37.1	Silky serrated.
2662	....do	....do	49,000	82,550	24.5	43.3	Silky.
2663	Muzzle, No. 31	....do	50,000	85,900	21.0	46.2	Silky serrated.
2664	....do	....do	48,000	84,900	21.0	49.1	Silky.
2647	Breech, No. 34	....do	45,000	85,400	17.0	30.7	Silky serrated.
2648	....do	....do	45,000	79,700	9.5	13.2	Granular, flaky spot.
2649	Muzzle, No. 34	....do	45,000	80,100	8.5	27.4	Silky flaky.
2650	....do	....do	42,000	81,750	10.0	5.7	Granular.
2655	Breech, No. 34	....do	48,000	86,550	19.0	43.3	Silky serrated.
56	....do	....do	50,000	89,000	23.0	43.3	Do.
...57	Muzzle, No. 34	....do	52,000	90,550	20.5	46.2	Silky.
2658	....do	....do	45,000	84,850	20.5	46.2	Do.
2691	Breech, No. 35	....do	48,000	83,950	28.5	43.3	Do.

	.....	..... do	46,000	81,400	26.0	46.2	Do.
	.....	..... do	46,000	83,480	22.5	49.1	Do.
	.....	..... do	45,000	81,700	24.5	43.3	Do.
778	Breech, No. 36	..... do	43,000	80,100	25.5	46.2	Do.
779	..... do	..... do	43,000	81,950	25.5	40.3	Do.
3680	Muzzle, No. 36	..... do	48,000	84,500	24.5	43.3	Do.
3681	..... do	..... do	47,000	81,900	20.0	46.2	Do.
3625	Breech, No. 37	..... do	47,000	88,900	22.0	43.3	Do.
3626	..... do	..... do	48,000	87,600	21.5	43.3	Do.
3627	Muzzle, No. 37	..... do	48,000	80,700	25.0	49.1	Do.
3628	..... do	..... do	44,000	82,950	22.5	49.1	Do.
3629	Breech, No. 38	..... do	45,000	80,000	16.0	23.9	Granular, flaky spot.
3630	..... do	..... do	44,000	81,280	20.0	37.4	Granular, 60 per cent.; dull flaky, 40 per cent.
3631	Muzzle, No. 38	..... do	46,000	85,500	16.0	30.7	Granular, 70 per cent.; dull flaky, 30 per cent.
3632	..... do	..... do	45,000	86,200	19.0	43.3	Silky.
3665	Breech, No. 38	..... do	49,000	88,550	20.5	34.0	Silky serrated.
3666	..... do	..... do	48,000	87,900	20.0	30.7	Silky serrated and granular.
3667	Muzzle, No. 38	..... do	47,000	82,300	24.0	40.3	Silky serrated.
3668	..... do	..... do	46,000	82,100	24.0	40.3	Do.
3584	Breech, No. 39	..... do	42,000	78,400	24.0	43.3	Silky.
3585	..... do	..... do	44,000	81,350	14.5	13.2	Granular, flaky spot.
3586	Muzzle, No. 39	..... do	50,000	89,950	13.5	16.9	Granular, flaky.
3587	..... do	..... do	51,000	87,000	14.5	27.4	Granular, dull spot.
3633	Breech, No. 39	..... do	44,000	84,050	25.0	49.1	Silky.
3634	..... do	..... do	44,000	83,050	26.5	51.9	Do.
3635	Muzzle, No. 39	..... do	44,000	80,400	26.5	46.2	Do.
3636	..... do	..... do	45,000	81,000	25.5	46.2	Do.
3611	Breech, No. 40	..... do	50,000	87,150	20.0	30.7	Granular, flaky spot.
3612	..... do	..... do	49,000	86,050	22.5	46.2	Silky.
3613	Muzzle, No. 40	..... do	46,000	87,900	20.0	37.1	Silky flaky, granular.
3614	..... do	..... do	42,000	81,850	23.0	37.1	Do.
3647	..... do	..... do	43,000	83,700	19.5	43.3	Silky.
3648	..... do	..... do	46,000	87,850	19.0	37.1	Silky; trace of granulation.
3649	Breech No. 40	..... do	43,000	83,450	25.0	43.3	Silky.
3650	..... do	..... do	44,000	82,550	19.5	30.7	Granular, dull spot.
3674	..... do	..... do	55,000	87,350	19.0	37.1	Silky serrated.
3675	..... do	..... do	53,000	87,550	17.5	37.1	Granular, silky serrated.
3676	Muzzle, No. 40	..... do	50,000	90,400	17.0	37.1	Silky serrated, 40 per cent.; granular, 60 per cent.
3677	..... do	..... do	50,000	89,900	18.0	43.3	Silky serrated
3603	Breech, No. 41	..... do	50,000	92,050	19.5	40.3	Silky.
3604	..... do	..... do	51,000	89,300	23.5	43.3	Do.
3605	Muzzle, No. 41	..... do	45,000	83,800	26.5	46.2	Do.
3606	..... do	..... do	45,000	85,100	23.0	37.1	Silky flaky, 60 per cent.; granular, 40 per cent.
3416	Muzzle, No. 42	..... do	49,000	84,950	19.5	43.3	Silky.
3417	..... do	..... do	49,000	85,300	25.5	43.3	Do.
3621	Breech, No. 43	..... do	47,000	86,000	9.5	13.2	Granular, flaky spot.
3622	..... do	..... do	46,000	84,600	14.0	9.5	Do.
3623	Muzzle, No. 43	..... do	44,000	83,950	19.5	30.7	Silky flaky
3624	..... do	..... do	44,000	83,850	16.5	37.1	Silky serrated.
3669	Breech, No. 43	..... do	44,000	82,950	20.0	27.4	Silky serrated, 25 per cent.; granular, 75 per cent.
3670	..... do	..... do	43,000	81,900	18.0	23.9	Silky serrated, 15 per cent.; granular, 85 per cent.
3671	Muzzle, No. 43	..... do	45,000	84,100	20.5	40.3	Silky serrated; trace of granulation.

TABULATION OF SPECIMENS FROM TUBES FOR 3″.2 STEEL B. L. RIFLES—Continued.

No. of test.	Position in gun.	Location of specimens.	Elastic limit per square inch.	Tensile strength per square inch.	Elongation.	Contraction of area.	Appearance of fracture.
			Pounds.	*Pounds.*	*Per cent.*	*Per cent.*	
3672	Muzzle, No. 43	Middle	44,000	82,800	20.0	23.9	Granular, silky serrated spot.
3683	Breech, No. 43	do	49,000	90,350	20.5	37.1	Silky flaky, 85 per cent.; granular, 15 per cent.
3684	do	do	52,000	92,150	19.0	30.7	Granular, flaky spot.
3685	Muzzle, No. 43	do	50,000	90,800	17.5	27.4	Silky flaky, 40 per cent.; granular, 60 per cent.
3686	do	do	52,000	93,850	18.0	23.9	Silky flaky, 45 per cent.; granular, 55 per cent.
3494	Breech, No. 46	do	47,000	85,000	20.5	27.4	Granular, 60 per cent.; silky serrated, 40 per cent.
3495	do	do	45,000	84,900	24.0	40.3	Silky.
3496	Muzzle, No. 46	do	48,000	90,200	20.0	37.1	Do.
3497	do	do	47,000	88,400	22.0	40.3	Do.
3538	Breech, No. 46	do	48,000	87,600	21.0	27.4	Granular, 60 per cent.; silky flaky, 40 per cent.
3539	do	do	45,000	84,500	25.0	43.3	Silky.
3426	Breech, No. 49	do	50,000	87,100	21.0	46.2	Do.
3427	do	do	49,000	87,850	21.0	40.2	Do.
3428	Muzzle, No. 49	do	48,000	87,400	19.0	43.3	Do.
3429	do	do	49,000	88,000	19.5	43.3	Do.

TABULATION OF SPECIMENS FROM JACKETS FOR 3″.2 STEEL B. L. RIFLES.

3563	Jacket, No. 26	Middle	50,000	90,850	19.0	23.9	Granular, silky spot.
3564	do	do	51,000	92,600	19.5	37.1	Granular, 40 per cent.; silky, 60 per cent.
3601	Jacket, No. 27	do	52,000	100,100	20.5	37.1	Silky, interspersed with granular metal.
3602	do	do	52,000	99,150	21.0	37.1	Silky, in part granular.
3510	Jacket, No. 30	do	51,000	93,350	20.0	30.7	Granular, dull spot.
3511	do	do	50,000	91,100	21.0	40.8	Silky.
3412	Jacket, No. 32	do	54,000	91,800	18.5	30.7	Granular, 70 per cent.; silky, 30 per cent.
3413	do	do	51,000	97,750	21.0	37.1	Silky, trace of granulation.
3414	Jacket, No. 33	do	50,000	96,250	16.5	23.9	Granular, dull spot.
3415	do	do	51,000	96,350	20.5	34.0	Silky, 50 per cent.; granular, 50 per cent.
3508	do	do	51,000	94,800	21.0	30.7	Silky, 30 per cent.; granular, 70 per cent.
3509	do	do	52,000	99,500	19.5	30.7	Granular, 60 per cent.; dull silky, 40 per cent.
3408	Jacket, No. 40	do	48,000	96,450	21.5	37.1	Silky.
3409	do	do	48,000	95,400	20.0	37.1	Do.
3415	do	do	55,000	107,050	18.5	34.0	Granular, silky center.
3416	do	do	54,000	104,450	19.0	37.1	Silky, granular at circumference.
3502	Jacket, No. 42	do	50,000	96,000	19.0	34.0	Granular, 60 per cent.; silky, 40 per cent.
3503	do	do	51,000	98,550	18.0	27.4	Granular, dull spot at circumference.
[illegible]	[illegible]	do	54,000	101,200	20.0	40.3	Silky.
		do	55,000	101,950	15.0	20.5	Granular, dull spot at circumference.

3555	....do	....do	52,000	94,050	19.0	40.3	Silky, 60 per cent.; granular, 40 per cent.
		....do	52,000	93,050	17.0	27.4	Granular, dull flaky spot.
1560	....do	....do	55,000	102,550	20.0	40.3	Silky.
1564	Jacket, No. 47	....do	55,000	103,200	19.5	37.1	Silky.
3505	....do	....do	54,000	101,350	20.0	37.1	Silky, interspersed with granular metal.
3529	Jacket, No. 48	....do	51,000	99,800	20.0	37.1	Silky, trace of granulation.
3530	....do	....do	51,000	99,600	22.0	40.3	Do.
3568	Jacket, No. 50	....do	56,000	100,600	20.5	40.3	Do.
3589	....do	....do	49,000	91,800	23.5	46.2	Do.
			49,000	91,400	21.0	46.2	Do.

TABULATION OF SPECIMENS FROM TRUNNION HOOPS FOR 3".2 STEEL B. L. RIFLES.

3574	Trunnion hoop, No. 27	Middle	54,000	98,450	22.5	37.1	Silky.
3575	....do	....do	54,000	98,400	24.5	40.3	Do.
3420	Trunnion hoop, No. 28	....do	58,000	109,600	19.5	30.7	Silky, interspersed with fine granulation.
3421	....do	....do	60,000	109,800	17.0	30.7	Granular, silky spot.
3505	Trunnion hoop, No. 29	....do	50,000	100,300	18.5	34.0	Silky.
3506	....do	....do	51,000	99,000	20.0	30.7	Silky, 60 per cent.; granular, 40 per cent.
3418	Trunnion hoop, No. 30	....do	52,000	96,300	15.0	23.9	Granular, 40 per cent.; dull, silky, 60 per cent.
3419	....do	....do	53,000	97,550	15.5	23.9	Granular, 60 per cent.; silky, 40 per cent.
3597	....do	....do	51,000	93,500	21.0	37.1	Silky, slightly granular.
3598	....do	....do	48,000	91,450	19.5	30.7	Granular, 60 per cent.; silky, 40 per cent.
3687	Trunnion hoop, No. 32	....do	55,000	102,000	25.0	43.3	Silky.
3688	....do	....do	55,000	102,200	18.5	30.7	Granular, dull silky spot.
3576	Trunnion hoop, No. 33	....do	47,000	91,800	21.5	37.1	Silky.
3577	....do	....do	46,000	89,100	25.0	37.1	Silky, granular spot.
3607	....do	....do	53,000	100,900	16.0	27.4	Granular, dull spot.
3608	....do	....do	50,000	97,500	18.5	23.9	Do.
3422	Trunnion hoop, No. 34	....do	47,000	89,950	21.5	34.0	Granular, 50 per cent.; silky, 50 per cent.
3423	....do	....do	47,000	90,250	22.0	34.0	Do.
3540	....do	....do	55,000	100,300	18.0	27.4	Granular, 70 per cent.; dull flaky, 30 per cent.
3541	....do	....do	52,000	99,000	15.0	23.9	Granular, 70 per cent.; dull silky, 30 per cent.
3641	....do	....do	54,000	96,050	18.5	30.7	Granular, 50 per cent.; dull silky, 50 per cent.
3642	....do	....do	52,000	92,200	23.0	37.1	Silky.
3506	Trunnion hoop, No. 35	....do	47,000	92,550	19.5	34.0	Silky, 60 per cent.; granular, 40 per cent.
3507	....do	....do	49,000	94,600	21.0	37.1	Silky.
3643	....do	....do	56,000	102,600	21.0	37.1	Do.
3644	....do	....do	54,000	100,150	16.0	23.9	Granular, dull spot.
3557	Trunnion hoop, No. 36	....do	49,000	92,750	21.0	40.3	Silky.
3558	....do	....do	47,000	90,400	19.5	40.3	Do.
3599	....do	....do	52,000	95,550	20.5	37.1	Granular, 60 per cent.; silky, 40 per cent.
3600	....do	....do	57,000	98,400	16.0	34.0	Do.
3568	Trunnion hoop, No. 37	....do	52,000	94,200	21.5	43.3	Silky.
3569	....do	....do	50,000	92,450	24.5	43.3	Do.
3578	Trunnion hoop, No. 38	....do	53,000	99,350	19.5	30.7	Granular, dull spot at circumference.
3579	....do	....do	53,000	99,600	18.5	27.4	Do.
3559	Trunnion hoop, No. 39	....do	50,000	99,600	21.0	37.1	Silky.
3560	....do	....do	51,000	99,800	18.5	34.0	Silky, trace of granulation.

TABULATION OF SPECIMENS FROM TRUNNION HOOPS FOR 3″.2 STEEL B. L. RIFLES—Continued.

No. of test.	Position in gun.	Location of specimens.	Elastic limit per square inch.	Tensile strength per square inch.	Elongation.	Contraction of area.	Appearance of fracture.
			Pounds.	*Pounds.*	*Per cent.*	*Per cent.*	
3404	Trunnion hoop, No. 41	Middle	53,000	98,850	19.0	37.1	Silky.
3405	do	do	54,000	98,800	19.5	37.1	Do.
3406	Trunnion hoop, No. 43	do	49,000	94,100	15.0	16.9	Granular, dull spot.
3407	do	do	49,000	93,650	18.5	30.7	Granular, 50 per cent.; silky, 50 per cent.
3561	do	do	50,000	94,600	20.5	40.3	Silky.
3562	do	do	53,000	97,900	18.5	34.0	Granular, 50 per cent.; silky, 50 per cent.
3527	Trunnion hoop, No. 44	do	46,000	88,800	21.5	37.1	Silky.
3528	do	do	47,000	89,850	19.5	40.3	Do.
3637	do	do	51,000	97,300	18.5	34.0	Granular, 40 per cent.; dull silky, 60 per cent.
3638	do	do	55,000	100,450	17.0	34.0	Granular, dull silky center.
3424	Trunnion hoop, No. 45	do	44,000	91,800	22.0	34.0	Silky.
3425	do	do	45,000	91,100	24.0	37.1	Do.
3542	do	do	61,000	104,100	14.5	37.1	Do.
3543	do	do	58,000	102,800	20.5	37.1	Do.
3580	Trunnion hoop, No. 47	do	51,000	93,500	23.5	40.3	Do.
3581	do	do	50,000	95,000	19.5	37.1	Silky, and fine granulation.
3570	Trunnion hoop, No. 48	do	50,000	93,450	22.5	37.1	Silky, trace of granulation.
3571	do	do	47,000	90,800	24.0	40.3	Silky.
3609	do	do	51,000	98,500	17.0	23.9	Granular, dull spot.
3610	do	do	54,000	100,350	21.0	37.1	Silky.
3659	do	do	52,000	95,850	24.5	34.0	Granular, dull spot.
3660	do	do	53,000	96,400	23.0	43.3	Silky, trace of granulation.
3572	Trunnion hoop, No. 49	do	53,000	98,300	23.5	40.3	Silky.
3573	do	do	52,000	98,000	23.5	40.3	Do.
3582	Trunnion hoop, No. 50	do	49,000	96,450	24.0	43.3	Do.
3583	do	do	54,000	96,800	21.0	37.1	Silky, in part granular.

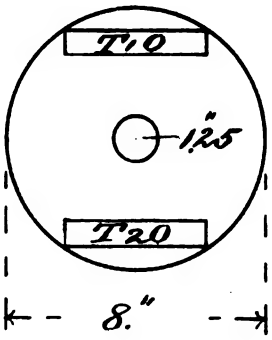
TABULATION OF SPECIMENS FROM SLEEVES, BREECH BLOCKS, BASE RINGS, AND DISKS REPRESENTING GAS-CHECK CUPS, FOR 3″.2 STEEL B. L. RIFLES.

3590	Sleeve, No. 42	Middle	54,000	91,000	24.0	51.6	Silky.
3567	Sleeve, No. 45	do	54,000	100,250	20.5	37.1	Do.
3411	Breech block, No. 33	do	50,000	94,850	19.0	37.1	Silky, slightly granular.
3410	Base ring, No. 31	do	47,000	91,550	25.0	46.2	Silky.
3672	Disks representing gas-check cups	Outside	62,000	112,050	18.5	43.3	Do.
3682		do	65,000	118,050	13.0	27.4	Granular, silky center.
3689		do	75,000	126,800	12.5	23.9	Do.

Disc for Gas Check Cups.

5 inch steel B.L. Rifle

7 inch steel B.L. Howitzer.



H Ex 45 50 2

DISC FOR GAS CHECK CUPS.

No. 3544.

Marks, $\frac{7\,H\,R_1\,G\,C}{T_1\,O}$
Diameter, ″.505.
Sectional area, ″.20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	.....	
2,000	10,000	.000300	.000200	0.	.....	
3,000	15,000	.000450	.000150	0.	.....	
4,000	20,000	.000600	.000150	0.	.....	
5,000	25,000	.000800	.000200	0.	.....	
6,000	30,000	.000950	.000150	0.	.....	
7,000	35,000	.001150	.000200	0.	.....	
8,000	40,000	.001300	.000150	0.	.....	
9,000	45,000	.001450	.000150	0.	.....	
10,000	50,000	.001600	.000150	0.	.....	
11,000	55,000	.001850	.000250	.....	.....	
12,000	60,000	.002000	.000150	.....	.....	
13,000	65,000	.002150	.000150	.....	.....	
14,000	70,000	.002350	.000200	.....	.....	
15,000	75,000	.002500	.000150	.....	.....	
16,000	80,000	.002700	.000200	.....	.....	
16,400	82,000	.002850	.000150	.....	.....	
16,600	83,000	.002900	.000150	.....	.....	
16,800	84,000	.003000	.000100	.....	.....	
17,000	85,000	.003100	.000100	.....	.....	Elastic limit.
17,200	86,000	.003350	.000250	.....	.....	
17,400	87,000	.003550	.000200	.....	.....	
17,600	88,000	.003700	.000150	.....	.....	
17,800	89,000	.003950	.000250	.....	.....	
18,000	90,000	.004200	.000250	.....	.....	
18,200	91,000	.004500	.000300	.....	.....	
18,400	92,000	.004750	.000250	.....	.....	
18,600	93,000	.005000	.000250	.....	.....	
18,800	94,000	.005500	.000500	.....	.....	
19,000	95,000	.005950	.000450	.....	.....	
19,200	96,000	.006350	.000400	.....	.....	
19,400	97,000	.006900	.000550	.....	.....	
19,600	98,000	.007250	.000350	.....	.....	
19,800	99,000	.007750	.000500	.....	.....	
20,000	100,000	.008200	.000450	.....	.....	
20,800	104,000	.0100	.0018	.....	.....	
22,400	112,000	.0125	.0025	.....	.....	
23,200	116,000	.0150	.0025	.....	.....	
24,000	120,000	.0175	.0025	.....	.....	
24,800	124,000	.0225	.0050	.....	.....	
25,600	128,000	.0250	.0025	.....	.....	
26,400	132,000	.0300	.0050	.....	.....	
27,200	136,000	.0350	.0050	.....	.....	
28,000	140,000	.0450	.0100	.....	.....	
28,800	144,000	.0600	.0150	.....	.....	
30,050	145,250	.0800	.0200	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section.....pounds.. 145,
tic limit per square inch of original section.....do.... 85,
gation per inch after rupture.....inch.. 0.1
gation per inch under strain at elastic limit.....do.... .003
action in diameter at point of rupture.....do.... .
iction in area after rupture, per centum of original section..... 2
tion of rupture.....″.70 from n
acter of broken surface.....granular; silky cen
gation of inch sections.....″.05, ″.

No. 3545.

Marks, $\frac{7\,H\,R,\,G\,C}{T_1\,O}$
Diameter, ".505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000150	.000150	0.	.....	
2,000	10,000	.000300	.000150	0.	.....	
3,000	15,000	.000500	.000200	0.	.....	
4,000	20,000	.000650	.000150	0.	.....	
5,000	25,000	.000850	.000200	0.	.....	
6,000	30,000	.001000	.000150	0.	.....	
7,000	35,000	.001150	.000150	0.	.....	
8,000	40,000	.001300	.000150	0.	.....	
9,000	45,000	.001500	.000200	0.	.....	
10,000	50,000	.001650	.000150	0.	.....	
11,000	55,000	.001800	.000150	.....	.....	
12,000	60,000	.002000	.000200	.....	.....	
13,000	65,000	.002100	.000100	.....	.....	
14,000	70,000	.002300	.000200	.....	.....	
15,000	75,000	.002450	.000150	.....	.....	
16,000	80,000	.002600	.000150	.....	.....	
16,200	81,000	.002650	.000050	.....	.....	
16,400	82,000	.002700	.000050	.....	.....	
16,600	83,000	.002750	.000050	.....	.....	
16,800	84,000	.002850	.000100	.....	.....	Elastic limit.
17,000	85,000	.003050	.000200	.....	.....	
17,200	86,000	.003200	.000150	.....	.....	
17,400	87,000	.003350	.000150	.....	.....	
17,600	88,000	.003600	.000250	.....	.....	
17,800	89,000	.003900	.000300	.....	.....	
18,000	90,000	.004200	.000300	.....	.....	
18,200	91,000	.004550	.000350	.....	.....	
18,400	92,000	.005000	.000450	.....	.....	
18,600	93,000	.005350	.000350	.....	.....	
18,800	94,000	.005850	.000500	.....	.....	
19,000	95,000	.006350	.000500	.....	.....	
19,200	96,000	.006850	.000500	.....	.....	
19,400	97,000	.007350	.000500	.....	.....	
19,600	98,000	.008050	.000700	.....	.....	
19,800	99,000	.008600	.000550	.....	.....	
20,000	100,000	.009650	.001050	.....	.....	
20,800	104,000	.0100	.000350	.....	.....	
21,600	108,000	.0125	.0025	.....	.....	
22,400	112,000	.0175	.0050	.....	.....	
23,200	116,000	.0200	.0025	.....	.....	
24,000	120,000	.0225	.0025	.....	.....	
24,800	124,000	.0275	.0050	.....	.....	
25,600	128,000	.0300	.0025	.....	.....	
26,400	132,000	.0375	.0075	.....	.....	
27,200	136,000	.0450	.0075	.....	.....	
29,000	140,000	.0525	.0075	.....	.....	
28,680	143,400	.0750	.0225	.....	.....	Tensile strength.

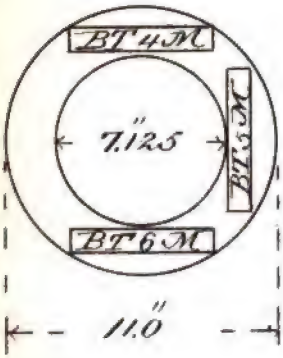
General summary.

Tensile strength per square inch of original section	pounds	143,400
Elastic limit per square inch of original section	do	84,000
Elongation per inch after rupture	inch	0.1000
Elongation per inch under strain at elastic limit	do	.002850
Reduction in diameter at point of rupture	do	.065
Reduction in area after rupture, per centum of original section		23.9
Position of rupture		".40 from neck
Character of broken surface	granular; dull eccentric spot	
Elongation of inch sections		".04, ".16*

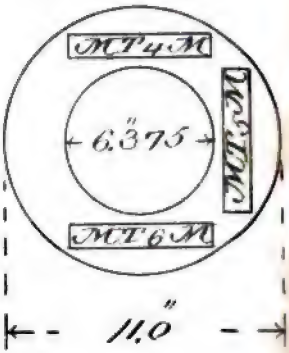
8 inch Steel B.L. Rifle

Lining Tube

Breech



Muzzle



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LINING TUBE—8-INCH STEEL B. L. RIFLE.

No. 3512.

Marks, $\frac{8\,B,\,L\,T}{B\,T,\,M}$
Diameter, ".564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	.....	
2,500	10,000	.000233	.000133	0.	.....	
3,750	15,000	.000433	.000200	0.	.....	
5,000	20,000	.000633	.000200	0.	.....	
6,250	25,000	.000800	.000167	0.	.....	
7,500	30,000	.001000	.000200	0.	.....	
8,750	35,000	.001167	.000167	0.	.....	
10,000	40,000	.001400	.000233	.....	.....	
10,250	41,000	.001433	.000033	.....	.....	
10,500	42,000	.001500	.000067	.....	.....	Elastic limit.
10,750	43,000	.001733	.000233	.....	.....	
11,000	44,000	.004000	.002267	.....	.....	
11,250	45,000	.005333	.001333	.....	.....	
11,500	46,000	.006067	.000734	.....	.....	
11,750	47,000	.006600	.000533	.....	.....	
12,000	48,000	.007667	.001067	.....	.....	
12,250	49,000	.008600	.000933	.....	.....	
12,500	50,000	.009733	.001133	.....	.....	
13,000	52,000	.011933	.002200	.....	.....	
13,500	54,000	.014633	.002800	.....	.....	
14,000	56,000	.017333	.002700	.....	.....	
14,500	58,000	.020100	.002867	.....	.....	
15,000	60,000	.023233	.003133	.....	.....	
15,500	62,000	.026667	.003434	.....	.....	
16,000	64,000	.030333	.003666	.....	.....	
16,500	66,000	.035067	.004734	.....	.....	
17,000	68,000	.040233	.005166	.....	.....	
17,500	70,000	.047000	.006767	.....	.....	
18,000	72,000	.053767	.006767	.....	.....	
18,500	74,000	.0633	.009533	.....	.....	
19,000	76,000	.0767	.0134	.....	.....	
19,500	78,000	.1100	.0333	.....	.....	
19,580	78,320	.1367	.0267	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	78,320
Elastic limit per square inch of original section	do ...	42,000
Elongation per inch after rupture	inch..	0.2067
Elongation per inch under strain at elastic limit	do....	.001500
Reduction in diameter at point of rupture	do....	.154
Reduction in area after rupture, per centum of original section		47.2
Position of rupture		1".55 from neck
Character of broken surface		silky
Elongation of inch sections		".13, ".38", ".11

No. 3513.

Marks, $\frac{S\ R\ L\ T}{B\ T\ M}$
Diameter, ″.564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000133	.000133	0.	.....	
2,500	10,000	.000300	.000167	0.	.....	
3,750	15,000	.000467	.000167	0.	.....	
5,000	20,000	.000633	.000166	0.	.....	
6,250	25,000	.000800	.000167	0.	.....	
7,500	30,000	.000967	.000167	0.	.....	
8,750	35,000	.001133	.000166	0.	.....	
10,000	40,000	.001333	.000200	.000033	.000033	
10,250	41,000	.001400	.000067	.....	.....	Elastic limit.
10,500	42,000	.001533	.000133	.....	.....	
10,750	43,000	.001800	.000267	.....	.....	
11,000	44,000	.003333	.001533	.....	.....	
11,250	45,000	.004333	.001000	.....	.....	
11,500	46,000	.005067	.000734	.....	.....	
11,750	47,000	.006067	.001000	.....	.....	
12,000	48,000	.007033	.000966	.....	.....	
12,250	49,000	.008033	.001000	.....	.....	
12,500	50,000	.009167	.001134	.....	.....	
12,750	51,000	.010067	.000900	.....	.....	
13,000	52,000	.011267	.001200	.....	.....	
13,500	54,000	.013667	.002400	.....	.....	
14,000	56,000	.016567	.002900	.....	.....	
14,500	58,000	.019333	.002766	.....	.....	
15,000	60,000	.021767	.002434	.....	.....	
15,500	62,000	.025400	.003633	.....	.....	
16,000	64,000	.029000	.003600	.....	.....	
16,500	66,000	.032667	.003667	.....	.....	
17,000	68,000	.037833	.005166	.....	.....	
17,500	70,000	.043533	.005700	.....	.....	
18,000	72,000	.0500	.006467	.....	.....	
18,500	74,000	.0567	.0067	.....	.....	
19,000	76,000	.0700	.0133	.....	.....	
19,500	78,000	.0933	.0233	.....	.....	
19,600	78,400	.1133	.0200	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	78,400
Elastic limit per square inch of original section	do....	41,000
Elongation per inch after rupture	inch..	0.1867
Elongation per inch under strain at elastic limit	do....	.001400
Reduction in diameter at point of rupture	do....	.154
Reduction in area after rupture, per centum of original section		47.2
Position of rupture		1″.26 from neck
Character of broken surface		silky
Elongation of inch sections		″.26*, ″.22*, ″.08

No. 3514.

Marks, $\frac{S\ R,\ L\ T}{B\ T,\ M}$
Diameter, $''.564$.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000133	.000133	0.	.....	
2,500	10,000	.000333	.000200	0.	.....	
3,750	15,000	.000533	.000200	0.	.....	
5,000	20,000	.000700	.000167	0.	.....	
6,250	25,000	.000900	.000200	0.	.....	
7,500	30,000	.001067	.000167	0.	.....	
8,750	35,000	.001233	.000166	.000033	.000033	
9,500	38,000	.001333	.000100	.....	.....	
9,750	39,000	.001400	.000067	.....	.....	Elastic limit.
10,000	40,000	.001933	.000533	.000533	.000500	
10,250	41,000	.002133	.000200	.....	.....	
10,500	42,000	.002667	.000534	.....	.....	
10,750	43,000	.003667	.001000	.....	.....	
11,000	44,000	.004600	.000933	.....	.....	
11,250	45,000	.005267	.000667	.....	.....	
11,500	46,000	.006267	.001000	.....	.....	
11,750	47,000	.007100	.000833	.....	.....	
12,000	48,000	.008267	.001167	.....	.....	
12,250	49,000	.009467	.001200	.....	.....	
12,500	50,000	.010733	.001266	.....	.....	
13,000	52,000	.013067	.002334	.....	.....	
13,500	54,000	.015667	.002600	.....	.....	
14,000	56,000	.018333	.002666	.....	.....	
14,500	58,000	.021433	.003100	.....	.....	
15,000	60,000	.024667	.003234	.....	.....	
15,500	62,000	.028000	.003333	.....	.....	
16,000	64,000	.032200	.004200	.....	.....	
16,500	66,000	.037233	.005033	.....	.....	
17,000	68,000	.042700	.005467	.....	.....	
17,500	70,000	.0500	.0073	.....	.....	
18,000	72,000	.0567	.0067	.....	.....	
18,500	74,000	.0700	.0133	.....	.....	
19,000	76,000	.0900	.0200	.....	.....	
19,360	77,440	.1333	.0433	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	77,440
Elastic limit per square inch of original section	do....	39,000
Elongation per inch after rupture	inch..	0.2107
Elongation per inch under strain at elastic limit	do....	.001400
Reduction in diameter at point of rupture	do....	.154
Reduction in area after rupture, per centum of original section	....	47.2
Position of rupture		1″.50 from neck
Character of broken surface		silky
Elongation of inch sections		″, 0, ″.37*, ″.18

No. 3515.

Marks, $\frac{8\,R_1\,L\,T}{M\,T_4\,M}$
Diameter, ″.564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000100	.000100	0.	.....	
2,500	10,000	.000267	.000167	0.	.....	
3,750	15,000	.000467	.000200	0.	.....	
5,000	20,000	.000667	.000200	0.	.....	
6,250	25,000	.000833	.000166	0.	.....	
7,500	30,000	.001033	.000200	0.	.....	
8,750	35,000	.001200	.000167	0.	.....	
9,000	36,000	.001233	.000033	.....	.....	
9,250	37,000	.001267	.000034	.....	.....	
9,500	38,000	.001333	.000066	.....	.....	
9,750	39,000	.001367	.000034	.....	.....	
10,000	40,000	.001400	.000033	.....	.....	
10,250	41,000	.001433	.000033	.....	.....	
10,500	42,000	.001500	.000067	.....	.....	Elastic limit.
10,750	43,000	.003533	.002033	.....	.....	
11,000	44,000	.005667	.002133	.....	.....	
11,250	45,000	.007067	.001400	.....	.....	
11,500	46,000	.007733	.000666	.....	.....	
11,750	47,000	.008533	.000800	.....	.....	
12,000	48,000	.009667	.001134	.....	.....	
12,250	49,000	.010600	.000933	.....	.....	
12,500	50,000	.011833	.001233	.....	.....	
13,000	52,000	.014333	.002500	.....	.....	
13,500	54,000	.016667	.002334	.....	.....	
14,000	56,000	.019333	.002666	.....	.....	
14,500	58,000	.022333	.003000	.....	.....	
15,000	60,000	.025267	.002934	.....	.....	
15,500	62,000	.028933	.003666	.....	.....	
16,000	64,000	.032700	.003767	.....	.....	
16,500	66,000	.037000	.004300	.....	.....	
17,000	68,000	.042167	.005167	.....	.....	
17,500	70,000	.0467	.004533	.....	.....	
18,000	72,000	.0567	.0100	.....	.....	
18,500	74,000	.0667	.0100	.....	.....	
19,000	76,000	.0767	.0100	.....	.....	
19,500	78,000	.1000	.0233	.....	.....	
19,760	79,040	.1400	.0400	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds	79,040
Elastic limit per square inch of original section	do	42,000
Elongation per inch after rupture	inch	0.1900
Elongation per inch under strain at elastic limit	do	.001500
Reduction in diameter at point of rupture	do	.104
Reduction in area after rupture, per centum of original section		33.5
Position of rupture		″.65 from neck
Character of broken surface		silky serrated
Elongation of inch sections		″.11, ″.14, ″.32

No. 3516.

Marks, $^{8\ E,\ I,\ T}_{M\ T,\ M}$
Diameter, ".564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000167	.000167	0.	.....	
2,500	10,000	.000333	.000166	0.	.....	
3,750	15,000	.000533	.000200	0.	.....	
5,000	20,000	.000700	.000167	0.	.....	
6,250	25,000	.000900	.000200	0.	.....	
7,500	30,000	.001033	.000138	0.	.....	
8,750	35,000	.001233	.000200	0.	.....	
9,000	36,000	.001267	.000034	.....	.....	
9,250	37,000	.001300	.000033	.....	.....	
9,500	38,000	.001333	.000033	.....	.....	
9,750	39,000	.001367	.000034	.....	.....	
10,000	40,000	.001400	.000033	.....	.....	
10,250	41,000	.001433	.000033	.....	.....	
10,500	42,000	.001533	.000100	.....	.....	Elastic limit.
10,750	43,000	.001733	.000200	.....	.....	
11,000	44,000	.005033	.004200	.....	.....	
11,250	45,000	.007000	.001067	.....	.....	
11,500	46,000	.007933	.000933	.....	.....	
11,750	47,000	.008733	.000800	.....	.....	
12,000	48,000	.009667	.000934	.....	.....	
12,250	49,000	.010667	.001000	.....	.....	
12,500	50,000	.011733	.001066	.....	.....	
13,000	52,000	.014200	.002467	.....	.....	
13,500	54,000	.016667	.002467	.....	.....	
14,000	56,000	.019333	.002666	.....	.....	
14,500	58,000	.022333	.003000	.....	.....	
15,000	60,000	.025267	.002934	.....	.....	
15,500	62,000	.028700	.003433	.....	.....	
16,000	64,000	.032833	.004133	.....	.....	
16,500	66,000	.037167	.004333	.....	.....	
17,000	68,000	.041833	.004666	.....	.....	
17,500	70,000	.0467	.004867	.....	.....	
18,000	72,000	.0567	.0100	.....	.....	
18,500	74,000	.0667	.0100	.....	.....	
19,000	76,000	.0767	.0100	.....	.....	
19,500	78,000	.1033	.0266	.....	.....	
19,750	79,000	.1567	.0534	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	79,000
Elastic limit per square inch of original section	do ...	42,000
Elongation per inch after rupture	inch..	0.2333
Elongation per inch under strain at elastic limit	do....	.001533
Reduction in diameter at point of rupture	do....	.144
Reduction in area after rupture, per centum of original section		44.6
Position of rupture		1".50 from neck
Character of broken surface		silky
Elongation of inch sections		".18, ".37, ".15

No. 3517.

Marks, $\frac{8\,R_1\,L\,T}{M\,T_6\,M}$
Diameter, ″.564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000167	.000167	0.	.....	
2,500	10,000	.000333	.000166	0.	.....	
3,750	15,000	.000500	.000167	0.	.....	
5,000	20,000	.000700	.000200	0.	.....	
6,250	25,000	.000833	.000133	0.	.....	
7,500	30,000	.001033	.000200	0.	.....	
8,750	35,000	.001200	.000167	.000033	.000033	
9,000	36,000	.001233	.000033	.....	.....	
9,250	37,000	.001267	.000034	.....	.....	
9,500	38,000	.001300	.000033	.....	.....	
9,750	39,000	.001367	.000067	.....	.....	
10,000	40,000	.001433	.000066	.....	.....	
10,250	41,000	.001467	.000034	.....	.....	Elastic limit.
10,500	42,000	.001833	.000366	.....	.....	
10,750	43,000	.002233	.000400	.....	.....	
11,000	44,000	.004133	.001900	.....	.....	
11,250	45,000	.006000	.001867	.....	.....	
11,500	46,000	.007167	.001167	.....	.....	
11,750	47,000	.008267	.001100	.....	.....	
12,000	48,000	.008867	.000600	.....	.....	
12,250	49,000	.010033	.001166	.....	.....	
12,500	50,000	.011000	.000967	.....	.....	
13,000	52,000	.013333	.002333	.....	.....	
13,500	54,000	.015500	.002167	.....	.....	
14,000	56,000	.018500	.003000	.....	.....	
14,500	58,000	.020767	.002267	.....	.....	
15,000	60,000	.023733	.002966	.....	.....	
15,500	62,000	.027333	.003600	.....	.....	
16,000	64,000	.030667	.003334	.....	.....	
16,500	66,000	.034833	.004166	.....	.....	
17,000	68,000	.039000	.004167	.....	.....	
17,500	70,000	.045333	.006333	.....	.....	
18,000	72,000	.0500	.004667	.....	.....	
18,500	74,000	.0600	.0100	.....	.....	
19,000	76,000	.0700	.0100	.....	.....	
19,500	78,000	.0867	.0167	.....	.....	
20,000	80,000	.1167	.0300	.....	.....	
20,070	80,280	.1400	.0233	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	80,280
Elastic limit per square inch of original section	do....	41,000
Elongation per inch after rupture	inch..	0.2033
Elongation per inch under strain at elastic limit	do....	.001467
Reduction in diameter at point of rupture	do....	.124
Reduction in area after rupture, per centum of original section		39.2
Position of rupture		1″ from neck
Character of broken surface		silky serrated
Elongation of inch sections		″.12, ″.17, ″.32*

No. 3517.

Marks, $\overset{S\ R_1\ L\ T}{M\ T_2\ M}$
Diameter, ″.564.
Sectional area, .25 square inch.

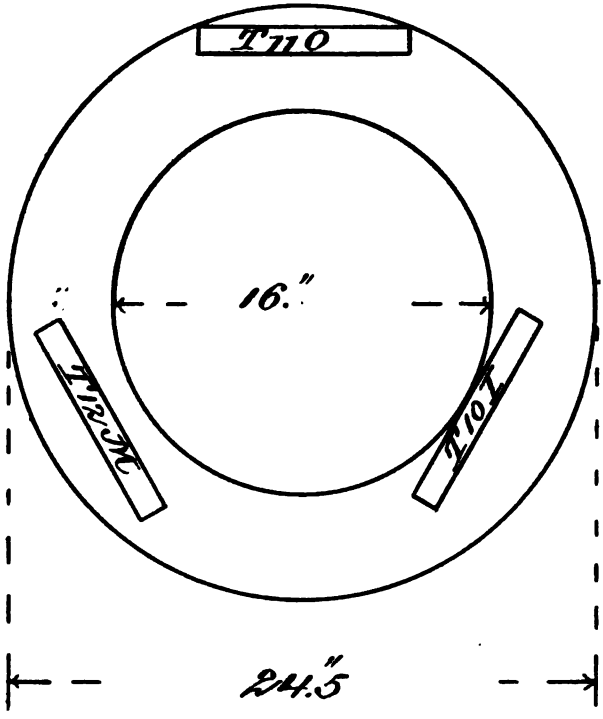
Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000167	.000167	0.		
2,500	10,000	.000333	.000166	0.		
3,750	15,000	.000500	.000167	0.		
5,000	20,000	.000700	.000200	0.		
6,250	25,000	.000833	.000133	0.		
7,500	30,000	.001033	.000200	0.		
8,750	35,000	.001200	.000167	.000033	.000033	
9,000	36,000	.001233	.000033			
9,250	37,000	.001267	.000034			
9,500	38,000	.001300	.000033			
9,750	39,000	.001367	.000067			
10,000	40,000	.001433	.000066			
10,250	41,000	.001467	.000034			Elastic limit.
10,500	42,000	.001833	.000366			
10,750	43,000	.002233	.000400			
11,000	44,000	.004133	.001900			
11,250	45,000	.006000	.001867			
11,500	46,000	.007167	.001167			
11,750	47,000	.008267	.001100			
12,000	48,000	.008867	.000600			
12,250	49,000	.010033	.001166			
12,500	50,000	.011000	.000967			
13,000	52,000	.013333	.002333			
13,500	54,000	.015500	.002167			
14,000	56,000	.018500	.003000			
14,500	58,000	.020767	.002267			
15,000	60,000	.023733	.002966			
15,500	62,000	.027333	.003600			
16,000	64,000	.030667	.003334			
16,500	66,000	.034833	.004166			
17,000	68,000	.039000	.004167			
17,500	70,000	.045333	.006333			
18,000	72,000	.0500	.004667			
18,500	74,000	.0600	.0100			
19,000	76,000	.0700	.0100			
19,500	78,000	.0867	.0167			
20,000	80,000	.1167	.0300			
20,070	80,280	.1400	.0233			Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	80,280
Elastic limit per square inch of original section	do....	41,000
Elongation per inch after rupture	inch..	0.2033
Elongation per inch under strain at elastic limit	do....	.001467
Reduction in diameter at point of rupture	do....	.124
Reduction in area after rupture, per centum of original section		39.2
Position of rupture		1″ from neck
Character of broken surface		silky serrated
Elongation of inch sections		″.12, ″.17, ″.32*

8 inch Steel B.L. Rifle.

Hoop D2



H Ex 45.50 2

HOOP D_2.

No. 3524.

Marks, $\frac{8\ E_1\ D_2}{T_{10}\ I}$
Diameter, ".564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000133	.000133	0.	.....	
2,500	10,000	.000300	.000167	0.	.....	
3,750	15,000	.000467	.000167	0.	.....	
5,000	20,000	.000633	.000166	0.	.....	
6,250	25,000	.000817	.000184	0.	.....	
7,500	30,000	.000983	.000166	0.	.....	
8,750	35,000	.001150	.000167	0.	.....	
10,000	40,000	.001317	.000167	0.	.....	
11,250	45,000	.001483	.000166	.....	.....	
12,500	50,000	.001650	.000167	.....	.....	
13,750	55,000	.001833	.000183	.....	.....	
14,000	56,000	.001867	.000034	.....	.....	
14,250	57,000	.001917	.000050	.....	.....	
14,500	58,000	.001967	.000050	.....	.....	
14,750	59,000	.002000	.000033	.....	.....	
15,000	60,000	.002050	.000050	.....	.....	
15,250	61,000	.002117	.000067	.....	.....	
15,500	62,000	.002167	.000050	.....	.....	
15,750	63,000	.002217	.000050	.....	.....	Elastic limit.
16,000	64,000	.002317	.000100	.....	.....	
16,250	65,000	.002450	.000133	.....	.....	
16,500	66,000	.002600	.000150	.....	.....	
17,000	68,000	.003033	.000433	.....	.....	
17,500	70,000	.003783	.000750	.....	.....	
18,000	72,000	.004850	.001067	.....	.....	
18,500	74,000	.006250	.001400	.....	.....	
19,000	76,000	.007833	.001583	.....	.....	
19,500	78,000	.009167	.001334	.....	.....	
20,000	80,000	.010833	.001666	.....	.....	
20,500	82,000	.012333	.001500	.....	.....	
21,000	84,000	.014000	.001667	.....	.....	
21,500	86,000	.015500	.001500	.....	.....	
22,000	88,000	.017167	.001667	.....	.....	
22,500	90,000	.018933	.001766	.....	.....	
23,000	92,000	.020833	.001900	.....	.....	
23,500	94,000	.022800	.001967	.....	.....	
24,000	96,000	.024833	.002033	.....	.....	
24,500	98,000	.027033	.002200	.....	.....	
25,000	100,000	.0300	.002967	.....	.....	
25,500	102,000	.0325	.0025	.....	.....	
26,000	104,000	.0358	.0033	.....	.....	
26,500	106,000	.0400	.0042	.....	.....	
27,000	107,000	.0433	.0033	.....	.....	
27,500	110,000	.0483	.0050	.....	.....	
28,000	112,000	.0550	.0067	.....	.....	
28,500	114,000	.0667	.0117	.....	.....	
28,790	115,160	.0850	.0183	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	115,160
Elastic limit per square inch of original section	do....	63,000
Elongation per inch after rupture	inch..	0.1167
Elongation per inch under strain at elastic limit	do....	.002217
Reduction in diameter at point of rupture	do....	.124
Reduction in area after rupture, per centum of original section		39.2
Position of rupture		2".70 from neck
Character of broken surface		silky
Elongation of inch sections		".06, ".11, ".29*, ".09, ".08, ".07

No. 3525.

Marks, $\frac{8\,R_1\,D_2}{T_{11}\,O}$
Diameter, ″.564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000150	.000150	0.	.....	
2,500	10,000	.000317	.000167	0.	.....	
3,750	15,000	.000467	.000150	0.	.....	
5,000	20,000	.000633	.000166	0.	.....	
6,250	25,000	.000800	.000167	0.	.....	
7,500	30,000	.000967	.000167	0.	.....	
8,750	35,000	.001150	.000183	0.	.....	
10,000	40,000	.001317	.000167	0.	.....	
11,250	45,000	.001500	.000183	.....	.....	
12,500	50,000	.001633	.000133	.....	.....	
13,750	55,000	.001800	.000167	.....	.....	
14,000	56,000	.001833	.000033	.....	.....	
14,250	57,000	.001883	.000050	.....	.....	
14,500	58,000	.001933	.000050	.....	.....	
14,750	59,000	.001967	.000034	.....	.....	
15,000	60,000	.002017	.000050	.....	.....	
15,250	61,000	.002050	.000033	.....	.....	
15,500	62,000	.002083	.000033	.....	.....	
15,750	63,000	.002117	.000034	.....	.....	
16,000	64,000	.002183	.000066	.....	.....	
16,250	65,000	.002233	.000050	.....	.....	
16,500	66,000	.002283	.000050	.....	.....	Elastic limit.
16,750	67,000	.002367	.000084	.....	.....	
17,000	68,000	.002450	.000083	.....	.....	
17,250	69,000	.002600	.000150	.....	.....	
17,500	70,000	.002783	.000183	.....	.....	
17,750	71,000	.002933	.000150	.....	.....	
18,000	72,000	.003233	.000300	.....	.....	
18,500	74,000	.004000	.000767	.....	.....	
19,000	76,000	.005083	.001083	.....	.....	
19,500	78,000	.006433	.001250	.....	.....	
20,000	80,000	.007533	.001200	.....	.....	
20,500	82,000	.008967	.001434	.....	.....	
21,000	84,000	.010583	.001616	.....	.....	
21,500	86,000	.011867	.001284	.....	.....	
22,000	88,000	.013450	.001583	.....	.....	
22,500	90,000	.014833	.001383	.....	.....	
23,000	92,000	.016333	.001500	.....	.....	
23,500	94,000	.017933	.001600	.....	.....	
24,000	96,000	.019667	.001734	.....	.....	
24,500	98,000	.021333	.001666	.....	.....	
25,000	100,000	.023167	.001834	.....	.....	
25,500	102,000	.025333	.002166	.....	.....	
26,000	104,000	.027333	.002000	.....	.....	
26,500	106,000	.0300	.002667	.....	.....	
27,000	108,000	.0333	.0033	.....	.....	
27,500	110,000	.0367	.0034	.....	.....	
28,000	112,000	.0383	.0016	.....	.....	
28,500	114,000	.0433	.0050	.....	.....	
29,000	116,000	.0483	.0050	.....	.....	
29,500	118,000	.0517	.0034	.....	.....	
30,000	120,000	.0617	.0100	.....	.....	
30,480	121,920	.0933	.0316	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section.....pounds.. 121,920
Elastic limit per square inch of original section.....do.... 66,000
Elongation per inch after rupture.....inch.. 0.1050
Elongation per inch under strain at elastic limit.....do.... .002283
Reduction in diameter at point of rupture.....do.... .104
Reduction in area after rupture, per centum of original section..... [illegible]3.5
Position of rupture.....at middle of [illegible]
Character of broken surface..... granular; silky ce[illegible]
Elongation of inch sections.....″.06, ″.08, ″.15, ″.20* [illegible] ″.07

No. 3526.

Marks, $\frac{S\ R_1\ D_2}{T_{12}\ M}$
Diameter, ".564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000150	.000150	0.	.....	
2,500	10,000	.000317	.000167	0.	.....	
3,750	15,000	.000483	.000166	0.	.....	
5,000	20,000	.000650	.000167	0.	.....	
6,250	25,000	.000817	.000167	0.	.....	
7,500	30,000	.000983	.000166	0.	.....	
8,750	35,000	.001150	.000167	0.	.....	
10,000	40,000	.001317	.000167	0.	.....	
11,250	45,000	.001467	.000150	.....	.....	
12,500	50,000	.001650	.000183	.....	.....	
13,750	55,000	.001817	.000167	.....	.....	
14,000	56,000	.001850	.000033	.....	.....	
14,250	57,000	.001900	.000050	.....	.....	
14,500	58,000	.001933	.000033	.....	.....	
14,750	59,000	.001983	.000050	.....	.....	
15,000	60,000	.002033	.000050	.....	.....	
15,250	61,000	.002083	.000050	.....	.....	
15,500	62,000	.002167	.000084	.....	.....	
15,750	63,000	.002233	.000066	.....	.....	Elastic limit.
16,000	64,000	.002350	.000117	.....	.....	
16,250	65,000	.002467	.000117	.....	.....	
16,500	66,000	.002650	.000183	.....	.....	
16,750	67,000	.002850	.000200	.....	.....	
17,000	68,000	.003117	.000267	.....	.....	
17,500	70,000	.003750	.000633	.....	.....	
18,000	72,000	.004583	.000833	.....	.....	
18,500	74,000	.005633	.001050	.....	.....	
19,000	76,000	.006683	.001050	.....	.....	
19,500	78,000	.008000	.001317	.....	.....	
20,000	80,000	.009117	.001117	.....	.....	
20,500	82,000	.010500	.001383	.....	.....	
21,000	84,000	.011850	.001350	.....	.....	
21,500	86,000	.013200	.001350	.....	.....	
22,000	88,000	.014467	.001267	.....	.....	
22,500	90,000	.016033	.001566	.....	.....	
23,000	92,000	.017633	.001600	.....	.....	
23,500	94,000	.019117	.001484	.....	.....	
24,000	96,000	.020700	.001583	.....	.....	
24,500	98,000	.022417	.001717	.....	.....	
25,000	100,000	.024333	.001916	.....	.....	
25,500	102,000	.026500	.002167	.....	.....	
26,000	104,000	.028500	.002000	.....	.....	
26,500	106,000	.030667	.002167	.....	.....	
27,000	108,000	.0333	.002633	.....	.....	
27,500	110,000	.0358	.0025	.....	.....	
28,000	112,000	.0383	.0025	.....	.....	
28,500	114,000	.0450	.0067	.....	.....	
29,000	116,000	.0500	.0050	.....	.....	
29,500	118,000	.0550	.0050	.....	.....	
30,000	120,000	.0667	.0117	.....	.....	
30,500	122,000	.0883	.0216	.....	.....	Tensile strength.

General summary.

sile strength per square inch of original section	pounds..	122,000
tic limit per square inch of original section	do....	63,000
gation per inch after rupture	inch..	0.1217
gation per inch under strain at elastic limit	do....	.002233
uction in diameter at point of rupture	do....	.094
uction in area after rupture, per centum of original section		30.6
tion of rupture		2".65 from neck
ture of broken surface		granular; silky center
ration of inch sections		".07, ".10, ".12, ".24*, ".12, ".08

THIRD HOOP D_2.

No. 3531.

Marks, $\frac{8\ R_1\ D_2}{T_{12}\ I}$
Diameter, ″.564.
Sectional area, .25 square inch.

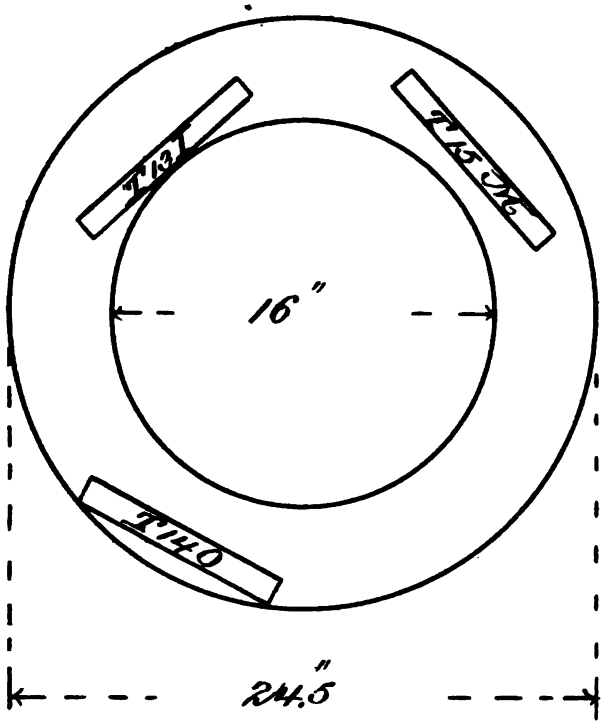
Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000133	.000133	0.		
2,500	10,000	.000300	.000167	0.		
3,750	15,000	.000467	.000167	0.		
5,000	20,000	.000633	.000166	0.		
6,250	25,000	.000783	.000150	0.		
7,500	30,000	.000933	.000150	0.		
8,750	35,000	.001100	.000167	0.		
10,000	40,000	.001283	.000183	0.		
11,250	45,000	.001433	.000150			
12,500	50,000	.001600	.000167			
12,750	51,000	.001633	.000033			
13,000	52,000	.001667	.000034			
13,250	53,000	.001700	.000033			
13,500	54,000	.001733	.000033			
13,750	55,000	.001767	.000034			
14,000	56,000	.001800	.000033			
14,250	57,000	.001833	.000033			
14,500	58,000	.001883	.000050			
14,750	59,000	.001917	.000034			
15,000	60,000	.001967	.000050			
15,250	61,000	.002000	.000033			Elastic limit.
15,500	62,000	.002083	.000083			
15,750	63,000	.002150	.000067			
16,000	64,000	.002300	.000150			
16,250	65,000	.002467	.000167			
16,500	66,000	.002717	.000250			
17,000	68,000	.003500	.000783			
17,500	70,000	.004500	.001000			
18,000	72,000	.006000	.001500			
18,500	74,000	.007333	.001333			
19,000	76,000	.008667	.001334			
19,500	78,000	.010000	.001333			
20,000	80,000	.011500	.001500			
20,500	82,000	.013167	.001667			
21,000	84,000	.014833	.001666			
21,500	86,000	.016167	.001334			
22,000	88,000	.017667	.001500			
22,500	90,000	.019500	.001833			
23,000	92,000	.021333	.001833			
23,500	94,000	.023167	.001834			
24,000	96,000	.024833	.001666			
24,500	98,000	.027000	.002167			
25,000	100,000	.029333	.002333			
25,500	102,000	.0333	.003967			
26,000	104,000	.0358	.0025			
26,500	106,000	.0400	.0042			
27,000	108,000	.0433	.0033			
27,500	110,000	.0467	.0034			
28,000	112,000	.0533	.0066			
28,500	114,000	.0617	.0084			
29,000	116,000	.0733	.0116			
29,380	117,520	.1017	.0284			Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	11' 520
Elastic limit per square inch of original section	do ...	6 000
Elongation per inch after rupture	inch..	0 1283
Elongation per inch under strain at elastic limit	do....	.0 2000
Reduction in diameter at point of rupture	do....	104
Reduction in area after rupture, per centum of original section		13.5
Position of rupture	at middle of	tem
Character of broken surface	granular; silky c	ıter
Elongation of inch sections	″.09, ″.10, ″.20*, ″.19*,	″.09

8 inch Steel B.L. Rifle

Third Hoop D2



H Ex 45 50 2

No. 3532.

Marks, $\frac{8\ R_1\ D_3}{T_{14}\ O}$
Diameter, ″.564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000167	.000167	.000033	.000033	
2,500	10,000	.000367	.000200	.000033	0.	
3,750	15,000	.000533	.000166	.000033	0.	
5,000	20,000	.000700	.000167	.000033	0.	
6,250	25,000	.000867	.000167	.000033	0.	
7,500	30,000	.001033	.000166	.000033	0.	
8,750	35,000	.001200	.000167	.000033	0.	
10,000	40,000	.001367	.000167	.000033	0.	
11,250	45,000	.001500	.000133	.....	.....	
12,500	50,000	.001667	.000167	.....	.....	
13,750	55,000	.001800	.000133	.....	.....	
14,000	56,000	.001833	.000033	.....	.....	
14,250	57,000	.001850	.000017	.....	.....	
14,500	58,000	.001900	.000050	.....	.....	
14,750	59,000	.001933	.000033	.....	.....	
15,000	60,000	.001983	.000050	.....	.....	
15,500	62,000	.002017	.000034	.....	.....	
15,750	63,000	.002050	.000033	.....	.....	Elastic limit.
16,000	64,000	.002150	.000100	.....	.....	
16,250	65,000	.002217	.000067	.....	.....	
16,500	66,000	.002267	.000050	.....	.....	
16,750	67,000	.002333	.000066	.....	.....	
17,000	68,000	.002450	.000117	.....	.....	
17,250	69,000	.002550	.000100	.....	.....	
17,500	70,000	.002800	.000250	.....	.....	
18,000	72,000	.003333	.000533	.....	.....	
18,500	74,000	.004667	.001334	.....	.....	
19,000	76,000	.006167	.001500	.....	.....	
19,500	78,000	.007667	.001500	.....	.....	
20,000	80,000	.009333	.001666	.....	.....	
20,500	82,000	.010833	.001500	.....	.....	
21,000	84,000	.012500	.001667	.....	.....	
21,500	86,000	.014000	.001500	.....	.....	
22,000	88,000	.015833	.001833	.....	.....	
22,500	90,000	.017500	.001667	.....	.....	
23,000	92,000	.019167	.001667	.....	.....	
23,500	94,000	.021167	.002000	.....	.....	
24,000	96,000	.023000	.001833	.....	.....	
24,500	98,000	.025167	.002167	.....	.....	
25,000	100,000	.027500	.002333	.....	.....	
25,500	102,000	.029 67	.002167	.....	.....	
26,000	104,000	.032833	.003166	.....	.....	
26,500	106,000	.0367	.003867	.....	.....	
27,000	108,000	.0417	.0050	.....	.....	
27,500	110,000	.0450	.0033	.....	.....	
28,000	112,000	.0500	.0050	.....	.....	
28,500	114,000	.0583	.0083	.....	.....	
29,000	116,000	.0717	.0134	.....	.....	
29,260	117,040	.0917	.0200	.....	.....	Tensile strength.

General summary.

T	le strength per square inch of original section ..... pounds..	117,040
E	c limit per square inch of original section ..... do....	63,000
E	ation per inch after rupture ..... inch..	0.1100
E	ation per inch under strain at elastic limit ..... do....	.002050
R	tion in diameter at point of rupture ..... do....	.114
R	ction in area after rupture, per centum of original section	36.4
P	on of rupture	″.60 from middle of stem
C	cter of broken surface	granular; silky center
R	ion of inch sections	″.07, ″.08, ″.27*, ″.09, ″.09, ″.06

No. 3533.

Marks, $\frac{S\ R_1\ D_2}{T_{15}\ M}$
Diameter, ″.564.
Sectional area, .25 square inch.

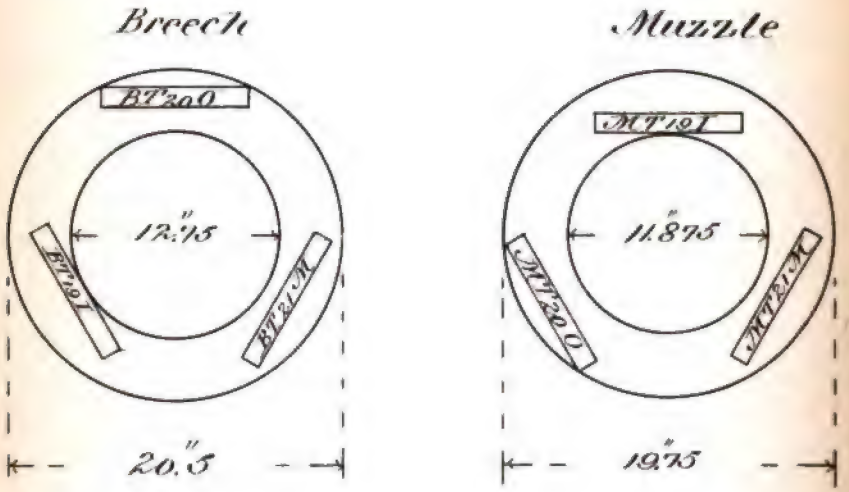
Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000133	.000133	0.	.....	
2,500	10,000	.000283	.000150	0.	.....	
3,750	15,000	.000450	.000167	0.	.....	
5,000	20,000	.000600	.000150	0.	.....	
6,250	25,000	.000767	.000167	0.	.....	
7,500	30,000	.000933	.000166	0.	.....	
8,750	35,000	.001083	.000150	0.	.....	
10,000	40,000	.001250	.000167	0.	.....	
11,250	45,000	.001400	.000150	.....	.....	
12,500	50,000	.001567	.000167	.....	.....	
13,750	55,000	.001733	.000166	.....	.....	
14,000	56,000	.001767	.000034	.....	.....	
14,250	57,000	.001800	.000033	.....	.....	
14,500	58,000	.001850	.000050	.....	.....	
14,750	59,000	.001883	.000033	.....	.....	
15,000	60,000	.001933	.000050	.....	.....	
15,250	61,000	.002000	.000067	.....	.....	
15,500	62,000	.002050	.000050	.....	.....	Elastic limit.
15,750	63,000	.002133	.000083	.....	.....	
16,000	64,000	.002233	.000100	.....	.....	
16,250	65,000	.002367	.000134	.....	.....	
16,500	66,000	.002600	.000233	.....	.....	
17,000	68,000	.003133	.000533	.....	.....	
17,500	70,000	.004133	.001000	.....	.....	
18,000	72,000	.005333	.001200	.....	.....	
18,500	74,000	.006667	.001334	.....	.....	
19,000	76,000	.008167	.001500	.....	.....	
19,500	78,000	.009500	.001333	.....	.....	
20,000	80,000	.011000	.001500	.....	.....	
20,500	82,000	.012333	.001333	.....	.....	
21,000	84,000	.014000	.001667	.....	.....	
21,500	86,000	.015500	.001500	.....	.....	
22,000	88,000	.017000	.001500	.....	.....	
22,500	90,000	.018833	.001833	.....	.....	
23,000	92,000	.020500	.001667	.....	.....	
23,500	94,000	.022333	.001833	.....	.....	
24,000	96,000	.024333	.002000	.....	.....	
24,500	98,000	.026667	.002334	.....	.....	
25,000	100,000	.028833	.002166	.....	.....	
25,500	102,000	.0317	.002867	.....	.....	
26,000	104,000	.0350	.0033	.....	.....	
26,500	106,000	.0383	.0033	.....	.....	
27,000	108,000	.0417	.0034	.....	.....	
27,500	110,000	.0483	.0066	.....	.....	
28,000	112,000	.0567	.0084	.....	.....	
28,500	114,000	.0617	.0050	.....	.....	
29,000	116,000	.0750	.0133	.....	.....	
29,220	116,880	.0967	.0217	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	116,880
Elastic limit per square inch of original section	do. ..	62,000
Elongation per inch after rupture	inch..	0.1360
Elongation per inch under strain at elastic limit	do....	.002050
Reduction in diameter at point of rupture	do....	.104
Reduction in area after rupture, per centum of original section		33.5
Position of rupture		1″.75 from neck
Character of broken surface		granular; silky center
Elongation of inch sections		″.11, ″.27*, ″.13, ″.10, ″.0[illegible] ″.08

10 inch Steel B. L. Rifle

Fourth Hoop C 7



H Ex 45 50 2

HOOP C_7.

No. 3518.

Marks, $\frac{10\ B_1\ C_7}{B\ T_{15}\ I}$
Diameter, ".565.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000083	.000083	0.	.....	
2,500	10,000	.000267	.000184	0.	.....	
3,750	15,000	.000433	.000166	0.	.....	
5,000	20,000	.000583	.000150	—.000017	—.000017	
6,250	25,000	.000750	.000167	—.000017	0.	
7,500	30,000	.000917	.000167	—.000033	—.000016	
8,750	35,000	.001067	.000150	—.000033	0.	
10,000	40,000	.001250	.000183	—.000033	0.	
11,250	45,000	.001417	.000167	.....	.....	
12,500	50,000	.001600	.000183	.....	.....	
12,750	51,000	.001633	.000033	.....	.....	
13,000	52,000	.001667	.000034	.....	.....	
13,250	53,000	.001683	.000016	.....	.....	
13,500	54,000	.001717	.000034	.....	.....	
13,750	55,000	.001767	.000050	.....	.....	
14,000	56,000	.001800	.000033	.....	.....	
14,250	57,000	.001833	.000033	.....	.....	
14,500	58,000	.001867	.000034	.....	.....	
14,750	59,000	.001917	.000050	.....	.....	
15,000	60,000	.001967	.000050	.....	.....	
15,250	61,000	.002033	.000066	.....	.....	
15,500	62,000	.002083	.000050	.....	.....	
15,750	63,000	.002150	.000067	.....	.....	Elastic limit.
16,000	64,000	.002300	.000150	.....	.....	
16,250	65,000	.002517	.000217	.....	.....	
16,500	66,000	.002917	.000400	.....	.....	
17,000	68,000	.003800	.000883	.....	.....	
17,500	70,000	.005117	.001317	.....	.....	
18,000	72,000	.006667	.001550	.....	.....	
18,500	74,000	.008000	.001333	.....	.....	
19,000	76,000	.009500	.001500	.....	.....	
19,500	78,000	.010900	.001400	.....	.....	
20,000	80,000	.012300	.001400	.....	.....	
20,500	82,000	.013767	.001467	.....	.....	
21,000	84,000	.015283	.001516	.....	.....	
21,500	86,000	.016833	.001550	.....	.....	
22,000	88,000	.018500	.001667	.....	.....	
22,500	90,000	.020217	.001717	.....	.....	
23,000	92,000	.022167	.001950	.....	.....	
23,500	94,000	.023833	.001666	.....	.....	
24,000	96,000	.025933	.002100	.....	.....	
24,500	98,000	.028133	.002200	.....	.....	
25,000	100,000	.0317	.003567	.....	.....	
25,500	102,000	.0342	.0025	.....	.....	
26,000	104,000	.0367	.0025	.....	.....	
26,500	106,000	.0400	.0033	.....	.....	
27,000	108,000	.0450	.0050	.....	.....	
27,500	110,000	.0500	.0050	.....	.....	
28,000	112,000	.0567	.0067	.....	.....	
28,500	114,000	.0683	.0016	.....	.....	
28,980	115,920	.1000	.0317	.....	.....	Tensile strength.

General summary.

le strength per square inch of original section	pounds.. 115,
c limit per square inch of original section	do .. 65,
gation per inch after rupture	inch.. 0.1
ation per inch under strain at elastic limit	do .. .002
tion in diameter at point of rupture	do ....
tion in area after rupture, per centum of original section	3
on of rupture	".80 from ne
cter of broken surface	silky, interspersed with granulation at the circumferer
ion of inch sections	".26*, ".12, ".10, ".11, ".11, "

No. 3519.

Marks, $\frac{10\ R_1\ C_7}{B\ T_{20}\ O}$
Diameter, ″.565.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000150	.000150	0.		
2,500	10,000	.000317	.000167	0.		
3,750	15,000	.000483	.000166	0.		
5,000	20,000	.000667	.000184	0.		
6,250	25,000	.000833	.000166	0.		
7,500	30,000	.001017	.000184	0.		
8,750	35,000	.001167	.000150	0.		
10,000	40,000	.001333	.000166	0.		
11,250	45,000	.001500	.000167			
12,500	50,000	.001667	.000167			
13,750	55,000	.001833	.000166			
14,000	56,000	.001867	.000034			
14,250	57,000	.001917	.000050			
14,500	58,000	.001983	.000066			
14,750	59,000	.002017	.000034			
15,000	60,000	.002100	.000083			Elastic limit.
15,250	61,000	.002383	.000283			
15,500	62,000	.003167	.000784			
15,750	63,000	.003700	.000533			
16,000	64,000	.004333	.000633			
16,500	66,000	.005750	.001417			
17,000	68,000	.007200	.001450			
17,500	70,000	.008417	.001217			
18,000	72,000	.009933	.001516			
18,500	74,000	.011250	.001317			
19,000	76,000	.012533	.001283			
19,500	78,000	.014083	.001550			
20,000	80,000	.015667	.001584			
20,500	82,000	.017167	.001500			
21,000	84,000	.018700	.001533			
21,500	86,000	.020417	.001717			
22,000	88,000	.022167	.001750			
22,500	90,000	.024050	.001883			
23,000	92,000	.026417	.002367			
23,500	94,000	.028476	.002050			
24,000	96,000	.0317	.003233			
24,500	98,000	.0342	.0025			
25,000	100,000	.0367	.0025			
25,500	102,000	.0400	.0033			
26,000	104,000	.0450	.0050			
26,500	106,000	.0500	.0050			
27,000	108,000	.0567	.0467			
27,500	110,000	.0683	.0116			
28,000	112,000	.0967	.0284			Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	112,000
Elastic limit per square inch of original section	do ...	60,000
Elongation per inch after rupture	inch..	0.1417
Elongation per inch under strain at elastic limit	do....	.002100
Reduction in diameter at point of rupture	do....	.135
Reduction in area after rupture, per centum of original section		41.9
Position of rupture	″.25 from	ck
Character of broken surface		ky
Elongation of inch sections	″.08, ″.10, ″.16, ″.30*, ″.1	.09

No. 3520.

Marks, $\frac{10\ R_1\ C_2}{B\ T_{21}\ M}$
Diameter, ″.565.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000133	.000133	0.	.....	
2,500	10,000	.000300	.000167	0.	.....	
3,750	15,000	.000450	.000150	0.	.....	
5,000	20,000	.000633	.000183	0.	.....	
6,250	25,000	.000800	.000167	0.	.....	
7,500	30,000	.000967	.000167	0.	.....	
8,750	35,000	.001133	.000166	0.	.....	
10,000	40,000	.001300	.000167	0.	.....	
11,250	45,000	.001467	.000167	0.	.....	
12,500	50,000	.001633	.000166	0.	.....	
13,750	55,000	.001800	.000167	.....	.....	
14,000	56,000	.001833	.000033	.....	.....	
14,250	57,000	.001883	.000050	.....	.....	Elastic limit.
14,500	58,000	.001967	.000084	.....	.....	
14,750	59,000	.002050	.000083	.....	.....	
15,000	60,000	.002417	.000367	.....	.....	
15,500	62,000	.003300	.000883	.....	.....	
16,000	64,000	.004667	.001367	.....	.....	
16,500	66,000	.006000	.001333	.....	.....	
17,000	68,000	.007267	.001267	.....	.....	
17,500	70,000	.008533	.001266	.....	.....	
18,000	72,000	.009950	.001417	.....	.....	
18,500	74,000	.011167	.001217	.....	.....	
19,000	76,000	.012700	.001533	.....	.....	
19,500	78,000	.014167	.001467	.....	.....	
20,000	80,000	.015667	.001500	.....	.....	
20,500	82,000	.017217	.001550	.....	.....	
21,000	84,000	.018667	.001450	.....	.....	
21,500	86,000	.020583	.001916	.....	.....	
22,000	88,000	.022350	.001767	.....	.....	
22,500	90,000	.024333	.001983	.....	.....	
23,000	92,000	.026417	.002084	.....	.....	
23,500	94,000	.028500	.002083	.....	.....	
24,000	96,000	.0317	.0032	.....	.....	
24,500	98,000	.0342	.0025	.....	.....	
25,000	100,000	.0367	.0025	.....	.....	
25,500	102,000	.0400	.0033	.....	.....	
26,000	104,000	.0450	.0050	.....	.....	
26,500	106,000	.0500	.0050	.....	.....	
27,000	108,000	.0550	.0050	.....	.....	
27,500	110,000	.0683	.0133	.....	.....	
27,990	111,960	.1000	.0317	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	111,960
Elastic limit per square inch of original section	do....	57,000
Elongation per inch after rupture	inch..	0.1367
Elongation per inch under strain at elastic limit	do....	.001883
Reduction in diameter at point of rupture	do....	.135
Reduction in area after rupture, per centum of original section		41.9
Position of rupture		3″.15 from neck
Character of broken surface		silky
Elongation of inch sections		″.07, ″.09, ″.13, ″.30*, ″.13, ″.1$_0$

No. 3521.

Marks, $\frac{10\ R_1\ C_7}{M\ T_9\ 1}$
Diameter, ".564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000150	.000150	0.	.....	
2,500	10,000	.000317	.000167	0.	.....	
3,750	15,000	.000500	.000183	0.	.....	
5,000	20,000	.000667	.000167	0.	.....	
6,250	25,000	.000833	.000166	0.	.....	
7,500	30,000	.001017	.000184	0.	.....	
8,750	35,000	.001183	.000166	0.	.....	
10,000	40,000	.001350	.000167	0.	.....	
11,250	45,000	.001517	.000167	0.	.....	
12,500	50,000	.001700	.000183	.000033	.000033	
13,750	55,000	.001850	.000150	.....	.....	
14,000	56,000	.001883	.000033	.....	.....	
14,250	57,000	.001917	.000034	.....	.....	
14,500	58,000	.001950	.000033	.....	.....	
14,750	59,000	.002017	.000067	.....	.....	
15,000	60,000	.002050	.000033	.....	.....	
15,250	61,000	.002117	.000067	.....	.....	
15,500	62,000	.002200	.000083	.....	.....	
15,750	63,000	.002233	.000033	.....	.....	Elastic limit.
16,000	64,000	.002383	.000150	.....	.....	
16,250	65,000	.002583	.000200	.....	.....	
16,500	66,000	.002750	.000167	.....	.....	
17,000	68,000	.003667	.000917	.....	.....	
17,500	70,000	.004700	.001033	.....	.....	
18,000	72,000	.006017	.001317	.....	.....	
18,500	74,000	.007433	.001416	.....	.....	
19,000	76,000	.008833	.001400	.....	.....	
19,500	78,000	.010283	.001450	.....	.....	
20,000	80,000	.011700	.001417	.....	.....	
20,500	82,000	.013083	.001383	.....	.....	
21,000	84,000	.014583	.001500	.....	.....	
21,500	86,000	.016133	.001550	.....	.....	
22,000	88,000	.017583	.001450	.....	.....	
22,500	90,000	.019250	.001667	.....	.....	
23,000	92,000	.021000	.001750	.....	.....	
23,500	94,000	.022967	.001967	.....	.....	
24,000	96,000	.025167	.002200	.....	.....	
24,500	98,000	.027133	.001966	.....	.....	
25,000	100,000	.0300	.002867	.....	.....	
25,500	102,000	.0325	.0025	.....	.....	
26,000	104,000	.0350	.0025	.....	.....	
26,500	106,000	.0375	.0025	.....	.....	
27,000	108,000	.0417	.0042	.....	.....	
27,500	110,000	.0467	.0050	.....	.....	
28,000	112,000	.0517	.0050	.....	.....	
28,500	114,000	.0617	.0100	.....	.....	
29,000	116,000	.0750	.0133	.....	.....	
29,220	116,880	.0983	.0233	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	116,880
Elastic limit per square inch of original section	do....	63,000
Elongation per inch after rupture	inch..	0.1233
Elongation per inch under strain at elastic limit	do....	.002233
Reduction in diameter at point of rupture	do ..	.104
Reduction in area after rupture, per centum of original section		33.5
Position of rupture		".90 from neck
Character of broken surface		granular; silky center
Elongation of inch sections		".23*, ".14, ".10, ".09, ".10, ".08

No. 3522.

Marks, $\frac{10\ R,\ C_7}{M\ T_{20}\ O}$
Diameter, ".564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000133	.000133	0.	.....	
2,500	10,000	.000300	.000167	0.	.....	
3,750	15,000	.000467	.000167	0.	.....	
5,000	20,000	.000633	.000166	0.	.....	
6,250	25,000	.000800	.000167	0.	.....	
7,500	30,000	.000967	.000167	0.	.....	
8,750	35,000	.001150	.000183	0.	.....	
10,000	40,000	.001300	.000150	0.	.....	
11,250	45,000	.001467	.000167	0.	.....	
12,500	50,000	.001633	.000166	0.	.....	
13,750	55,000	.001800	.000167	.....	.....	
14,000	56,000	.001833	.000033	.....	.....	
14,250	57,000	.001883	.000050	.....	.....	
14,500	58,000	.001933	.000050	.....	.....	
14,750	59,000	.001967	.000034	.....	.....	
15,000	60,000	.002000	.000033	.....	.....	
15,250	61,000	.002067	.000067	.....	.....	
15,500	62,000	.002133	.000066	.....	.....	
15,750	63,000	.002167	.000034	.....	.....	Elastic limit.
16,000	64,000	.002317	.000150	.....	.....	
16,250	65,000	.002467	.000150	.....	.....	
16,500	66,000	.002667	.000200	.....	.....	
17,000	68,000	.003400	.000733	.....	.....	
17,500	70,000	.004300	.000900	.....	.....	
18,000	72,000	.005583	.001283	.....	.....	
18,500	74,000	.006917	.001334	.....	.....	
19,000	76,000	.008333	.001416	.....	.....	
19,500	78,000	.009783	.001450	.....	.....	
20,000	80,000	.011250	.001467	.....	.....	
20,500	82,000	.012633	.001383	.....	.....	
21,000	84,000	.014000	.001367	.....	.....	
21,500	86,000	.015433	.001433	.....	.....	
22,000	88,000	.017083	.001650	.....	.....	
22,500	90,000	.018700	.001617	.....	.....	
23,000	92,000	.020467	.001767	.....	.....	
23,500	94,000	.022267	.001800	.....	.....	
24,000	96,000	.024250	.001983	.....	.....	
24,500	98,000	.026417	.002167	.....	.....	
25,000	100,000	.028583	.002166	.....	.....	
25,500	102,000	.0308	.002217	.....	.....	
26,000	104,000	.0333	.0025	.....	.....	
26,500	106,000	.0367	.0034	.....	.....	
27,000	108,000	.0400	.0033	.....	.....	
27,500	110,000	.0450	.0050	.....	.....	
28,000	112,000	.0500	.0050	.....	.....	
28,500	114,000	.0600	.0100	.....	.....	
29,000	116,000	.0700	.0100	.....	.....	
29,180	116,720	.0950	.0250	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	116,720
Elastic limit per square inch of original section	do....	63,000
gation per inch after rupture	inch..	0.1250
nation per inch under strain at elastic limit	do....	.002167
ction in diameter at point of rupture	do....	.114
tion in area after rupture, per centum of original section		36.4
on of rupture		2" from neck
ster of broken surface		granular; silky center
tion of inch sections		".09, ".29*, ".13, ".10, ".08, ".06

No. 3523.

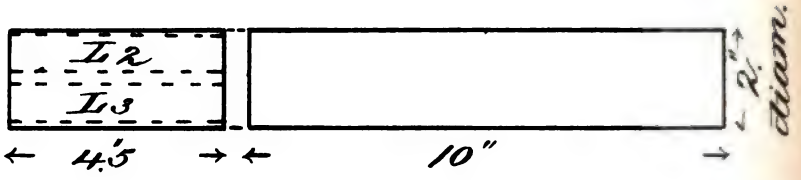
Marks, $\frac{10\ R_1\ C_7}{M\ T_{21}\ M}$
Diameter, ″.564.
Sectional area, .25 square inch.

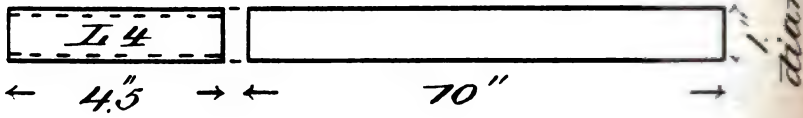
Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000133	.000133	0.	.....	
2,500	10,000	.000300	.000167	0.	.....	
3,750	15,000	.000483	.000183	0.	.....	
5,000	20,000	.000633	.000150	0.	.....	
6,250	25,000	.000800	.000167	0.	.....	
7,500	30,000	.000967	.000167	0.	.....	
8,750	35,000	.001133	.000166	0.	.....	
10,000	40,000	.001300	.000167	0.	.....	
11,250	45,000	.001467	.000167	0.	.....	
12,500	50,000	.001633	.000166	0.	.....	
13,750	55,000	.001800	.000167	.....	.....	
14,000	56,000	.001833	.000033	.....	.....	
14,250	57,000	.001867	.000034	.....	.....	Elastic limit.
14,500	58,000	.001983	.000116	.....	.....	
14,750	59,000	.002033	.000050	.....	.....	
15,000	60,000	.002183	.000150	.....	.....	
15,250	61,000	.002350	.000167	.....	.....	
15,500	62,000	.002583	.000233	.....	.....	
16,000	64,000	.003200	.000617	.....	.....	
16,500	66,000	.004017	.000817	.....	.....	
17,000	68,000	.005050	.001033	.....	.....	
17,500	70,000	.006333	.001283	.....	.....	
18,000	72,000	.007750	.001417	.....	.....	
18,500	74,000	.009017	.001267	.....	.....	
19,000	76,000	.010250	.001233	.....	.....	
19,500	78,000	.011500	.001250	.....	.....	
20,000	80,000	.012800	.001300	.....	.....	
20,500	82,000	.014250	.001450	.....	.....	
21,000	84,000	.015950	.001700	.....	.....	
21,500	86,000	.017417	.001467	.....	.....	
22,000	88,000	.018850	.001433	.....	.....	
22,500	90,000	.020583	.001733	.....	.....	
23,000	92,000	.022333	.001750	.....	.....	
23,500	94,000	.024167	.001834	.....	.....	
24,000	96,000	.026117	.001950	.....	.....	
24,500	98,000	.028200	.002083	.....	.....	
25,000	100,000	.0317	.0035	.....	.....	
25,500	102,000	.0333	.0016	.....	.....	
26,000	104,000	.0358	.0025	.....	.....	
26,500	106,000	.0383	.0025	.....	.....	
27,000	108,000	.0450	.0067	.....	.....	
27,500	110,000	.0500	.0050	.....	.....	
28,000	112,000	.0550	.0050	.....	.....	
28,500	114,000	.0683	.0133	.....	.....	
28,840	115,360	.0883	.0200	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	115,360
Elastic limit per square inch of original section	do....	57,000
Elongation per inch after rupture	inch..	0.1300
Elongation per inch under strain at elastic limit	do....	.001867
Reduction in diameter at point of rupture	do....	114
Reduction in area after rupture, per centum of original section		5.4
Position of rupture		2″.80 from ck
Character of broken surface		granular; silky c ter
Elongation of inch sections		″.09, ″.11, ″.10, ″.28*, ″.13 .09

Forgings for Pressure Gauges.





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FORGINGS FOR PRESSURE GAUGES.

No. 3546.

Marks, $\frac{P\ G}{L_2}$
Diameter, ".505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000100	.000100	0.	.....	
2,000	10,000	.000250	.000150	0.	.....	
3,000	15,000	.000400	.000150	0.	.....	
4,000	20,000	.000550	.000150	0.	.....	
5,000	25,000	.000700	.000150	0.	.....	
6,000	30,000	.000900	.000200	0.	.....	
7,000	35,000	.001050	.000150	0.	.....	
8,000	40,000	.001250	.000200	0.	.....	
9,000	45,000	.001400	.000150	.....	.....	
10,000	50,000	.001600	.000200	.....	.....	
11,000	55,000	.001850	.000250	.....	.....	
11,200	56,000	.001850	0.	.....	.....	
11,400	57,000	.001900	.000050	.....	.....	
11,600	58,000	.001950	.000050	.....	.....	
11,800	59,000	.001950	0.	.....	.....	
12,000	60,000	.002000	.000050	.....	.....	
12,200	61,000	.002050	.000050	.....	.....	
12,400	62,000	.002050	0.	.....	.....	Elastic limit.
12,600	63,000	.004600	.002550	.....	.....	
12,800	64,000	.006500	.001900	.....	.....	
13,000	65,000	.007000	.000500	.....	.....	
13,200	66,000	.007250	.000250	.....	.....	
13,600	68,000	.008000	.000750	.....	.....	
14,000	70,000	.009000	.001000	.....	.....	
14,400	72,000	.009750	.000750	.....	.....	
14,800	74,000	.010550	.000800	.....	.....	
15,200	76,000	.011500	.000950	.....	.....	
15,600	78,000	.012350	.000850	.....	.....	
16,000	80,000	.013150	.000800	.....	.....	
16,400	82,000	.014100	.000950	.....	.....	
16,800	84,000	.015150	.001050	.....	.....	
17,200	86,000	.016250	.001100	.....	.....	
17,600	88,000	.017350	.001100	.....	.....	
18,000	90,000	.018250	.000900	.....	.....	
18,400	92,000	.019200	.000950	.....	.....	
18,800	94,000	.020350	.001150	.....	.....	
19,200	96,000	.021600	.001250	.....	.....	
19,600	98,000	.022850	.001250	.....	.....	
20,000	100,000	.024150	.001300	.....	.....	
20,400	102,000	.025600	.001450	.....	.....	
20,800	104,000	.027100	.001500	.....	.....	
21,200	106,000	.028900	.001800	.....	.....	
21,600	108,000	.030600	.001700	.....	.....	
22,000	110,000	.031900	.001300	.....	.....	
22,400	112,000	.033900	.002000	.....	.....	
22,800	114,000	.035650	.001750	.....	.....	
23,200	116,000	.038100	.002450	.....	.....	
23,600	118,000	.040750	.002650	.....	.....	
24,000	120,000	.043650	.002900	.....	.....	
24,800	124,000	.0500	.006350	.....	.....	
25,600	128,000	.0600	.0100	.....	.....	
26,380	131,900	.1200	.0600	.....	.....	Tensile strength.

General summary.

...e strength per square inch of original section	pounds..	131,900
...ic limit per square inch of original section	do....	62,000
...ation per inch after rupture	inch..	0.1150
...ation per inch under strain at elastic limit	do....	.002050
...ction in diameter at point of rupture	do....	.035
...tion in area after rupture, per centum of original section		13.2
...n of rupture		1".13 from neck
...ster of broken surface	granular, radiating from a dull spot at the circumference	
...tion of inch sections		".13", ".10

No. 762.

Marks, $\frac{P\,G}{L_S}$
Length, 4″.
Diameter, ″.798.
Sectional area, .50 square inch.
Gauged length, 3″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
500	1,000	0.	0.	0.	0.	Initial load.
2,500	5,000	.000067	.000067	0.	.....	
5,000	10,000	.000167	.000100	0.	.....	
7,500	15,000	.000267	.000100	0.	.....	
10,000	20,000	.000400	.000133	0.	.....	
12,500	25,000	.000500	.000100	0.	.....	
15,000	30,000	.000667	.000167	0.	.....	
17,500	35,000	.000833	.000166	0.	.....	
20,000	40,000	.000967	.000134	0.	.....	
22,500	45,000	.001133	.000166	0.	.....	
25,000	50,000	.001300	.000167	0.	.....	
27,500	55,000	.001500	.000200	.....	.....	
30,000	60,000	.001667	.000167	.....	.....	
32,500	65,000	.001900	.000233	.....	.....	Elastic limit.
31,000	62,000	.004767	.002867	.....	.....	
31,500	63,000	.005000	.000233	.....	.....	
32,000	64,000	.005367	.000367	.....	.....	
32,500	65,000	.006233	.000866	.....	.....	
33,000	66,000	.006833	.000600	.....	.....	
33,500	67,000	.007067	.000234	.....	.....	
34,000	68,000	.007333	.000266	.....	.....	
34,500	69,000	.007667	.000334	.....	.....	
35,000	70,000	.008067	.000400	.....	.....	
68,980	137,960	.....	.....	.....	.....	Ultimate strength.

General summary.

Elastic limit per square inch of original section	pounds..	65,000
Compression per inch under stress at elastic limit	inch..	0.001900
Ultimate strength per square inch of original section	pounds..	137,960
Manner of failure		triple flexure

No. 763.

Marks, $\frac{P\,G}{I_4}$
Length, 4″.
Diameter, ″.798.
Sectional area, .50 square inch.
Gauged length, 3″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
500	1,000	0.	0.	0.	0.	Initial load.
2,500	5,000	.000133	.000133	0.	.....	
5,000	10,000	.000300	.000167	0.	.....	
7,500	15,000	.000467	.000167	0.	.....	
10,000	20,000	.000667	.000200	0.	.....	
12,500	25,000	.000800	.000133	0.	.....	
15,000	30,000	.000967	.000167	0.	.....	
17,500	35,000	.001167	.000200	0.	.....	
20,000	40,000	.001333	.000166	0.	.....	
22,500	45,000	.001467	.000134	0.	.....	
25,000	50,000	.001633	.000166	.000083	.000033	
27,500	55,000	.001800	.000167	.....	.....	
30,000	60,000	.001967	.000167	.....	.....	
32,500	65,000	.002167	.000500	.....	.....	Elastic limit.
33,000	66,000	.003333	.001166	.....	.....	
32,000	64,000	.003433	.000100	.....	.....	
32,500	65,000	.003667	.000234	.....	.....	
33,000	66,000	.005167	.001500	.....	.....	
33,500	67,000	.009167	.004000	.....	.....	
34,000	68,000	.009667	.000500	.....	.....	
34,500	69,000	.010000	.000333	.....	.....	
35,000	70,000	.010667	.000667	.....	.....	
67,180	134,360	.....	.....	.....	.....	Ultimate strength.

General summary.

Elastic limit per square inch of original section	pounds..	65,000
Compression per inch under stress at elastic limit	inch..	0.002167
Ultimate strength per square inch of original section	pounds..	134,360
Manner of failure		triple flexure

SPECIMEN FROM STEEL ON HAND AFTER MANUFACTURING CRUSHER GAUGES.

No. 761.

Marks, 4296.
Length, 4″.
Diameter, ″.799.
Sectional area, .50 square inch.
Gauged length, 3″.

Applied loads.		Compression per inch.	Successive compression per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
500	1,000	0.	0.	0.	0.	Initial load.
2,500	5,000	.000167	.000167	0.	.....	
5,000	10,000	.000300	.000133	0.	.....	
7,500	15,000	.000400	.000100	0.	.....	
10,000	20,000	.000567	.000167	0.	.....	
12,500	25,000	.000700	.000133	0.	.....	
15,000	30,000	.000867	.000167	0.	.....	
17,500	35,000	.001000	.000133	0.	.....	
20,000	40,000	.001167	.000167	0.	.....	
22,500	45,000	.001333	.000166	0.	.....	
25,000	50,000	.001500	.000167	0.	.....	
27,500	55,000	.001667	.000167	0.	.....	
30,000	60,000	.001800	.000133	0.	.....	
32,500	65,000	.001967	.000167	.....	.....	
35,000	70,000	.002133	.000166	.....	.....	
37,500	75,000	.002267	.000134	.....	.....	
40,000	80,000	.002467	.000200	.....	.....	
42,500	85,000	.002667	.000200	.....	.....	
43,000	86,000	.002700	.000033	.....	.....	
43,500	87,000	.002767	.000067	.....	.....	
44,000	88,000	.002833	.000066	.....	.....	Elastic limit.
44,500	89,000	.003000	.000167	.....	.....	
45,000	90,000	.003833	.000833	.....	.....	
45,500	91,000	.004600	.000767	.....	.....	
46,000	92,000	.004967	.000367	.....	.....	
46,500	93,000	.005333	.000366	.....	.....	
47,000	94,000	.005800	.000467	.....	.....	
47,500	95,000	.006333	.000533	.....	.....	
48,000	96,000	.006667	.000334	.....	.....	
48,500	97,000	.007200	.000533	.....	.....	
49,000	98,000	.007700	.000500	.....	.....	
49,500	99,000	.008338	.000638	.....	.....	
50,000	100,000	.008833	.000500	.....	.....	
75,760	151,520	.....	.....	.....	.....	Ultimate strength.

General summary.

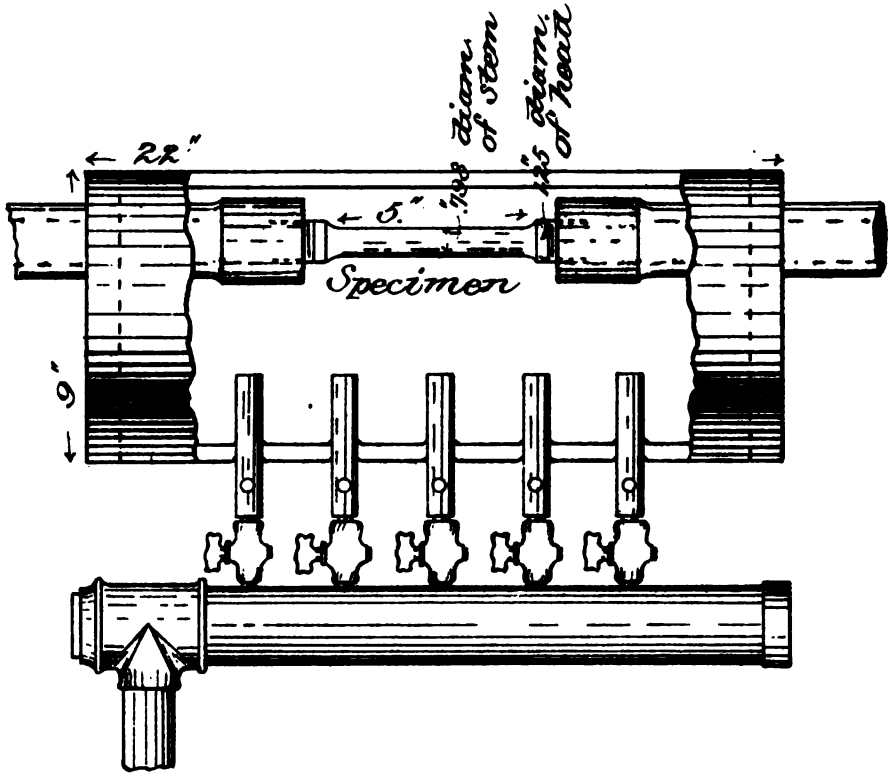
Elastic limit per square inch of original section	pounds..	88,000
Compression per inch under stress at elastic limit	inch..	0.002833
Ultimate strength per square inch of original section	pounds..	151,520
Manner of failure		triple flexure

TEMPERATURE TESTS.

TENSILE TESTS OF STEEL, WROUGHT IRON, AND CAST-IRON AT DIFFERENT TEMPERATURES.

Temperature tests.

Muffle in which specimens were heated and tested.



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DESCRIPTION OF TESTS.

This series, continued from preceding years, includes in the present report tensile tests at different temperatures from zero to 1694 degrees Fahr., made with the same lots of steel bars heretofore experimented upon and identified by the distinguishing marks 1–833 to 10–334; also tests of wrought irons marked A and B, specimens from a muck-bar tender axle and specimens of cast (gun) iron.

The steel specimens and wrought iron B were turned down from bars 1¼″ diameter, wrought-iron specimens A from a bar 1″.48 diameter, and the cast-iron specimens were taken from a thin slab of gun iron.

The muck-bar axle specimens were from axle No. 5, of which tensile tests were reported in 1887.

The specimens for these hot tests came from the sections between the wheel seats and the middle of its length.

Wrought iron A had been tested previously in the form of a bar with threaded ends and fractured in the thread.

This bar was selected for hot tests because it had been found very red-short at a welding heat.

When in position for testing the specimens were screwed into auxiliary bars, which latter bars were held in the hydraulic jaws of the machine.

A sheet-iron muffle with double walls surrounded the specimen, the auxiliary bars passing through the ends.

The heating was done by means of a triple row of Bunsen's gas-burners, arranged below the specimen and within the muffle.

The temperature of the specimens under test was estimated from their expansion, assuming the co-efficient of expansion to have the same value at high temperatures which had been found by comparison with mercurial thermometers, as recorded in the experiments of 1887, and at which time the following co-efficients were determined:

Metal.	Marks.	Co-efficient of expansion.
Wrought iron	.....	.0000067302
Steel	1–833	.0000067561
Do	2–123	.0000066259
Do	3–782	.0000065149
Do	4–795	.0000066597
Do	5–803	.0000066202
Do	6–797	.0000063891
Do	7–823	.0000064716
Do	8–750	.0000062167
Do	9–756	.0000062335
Do	10–334	.0000061700
Cast-iron	.....	.0000059261

For the purpose of determining the expansion of the specimens, a gauged length of 6 inches was established on each, and defined by small drilled and counter-sunk holes in the heads of the specimens.

An initial micrometer observation was taken on the gauged length of the bar at the temperature of the room, and observations repeated

after higher temperatures were reached, the difference in readings showing the amount of expansion, and the corresponding temperature added to that of the testing room gave the total estimated temperature.

Access to the specimen was had through holes in the top of the muffle, through which were passed the conical points of the micrometer.

In measuring the hot bar the micrometer points were exposed to the heat of the muffle from one to two seconds time.

The brevity of the interval of exposure to a high temperature prevented the beam of the micrometer from becoming sensibly heated.

It is not thought that the instrumental error in determining the expansion of the specimen exceeded ″.0002 in the gauged length of 6″, which corresponds to a variation of temperature of $5\frac{4}{10}$° Fahr., according to the lowest co-efficient of expansion used.

This direct method of determining the temperatures of the hot bars was considered preferable to other methods which might have been employed.

The interval of time employed in making a test ranged from 5 to 10 minutes, according to the strength and temperature of the specimen; the longer time being employed with strong specimens at comparatively low temperatures, in which a large number of observations was made on the elongation of the metal.

The temperature of the specimen was brought up to that of testing, and there maintained for a length of time equal to or greater than that required for making the test. The temperature was regulated by varying the number of gas-burners used and the pressure of the gas, also by means of diaphragms placed within the muffle for diffusing the heat.

Bars tested at or near zero temperature were exposed to that temperature over night, out of doors, and while tested were covered with a mixture of snow and salt.

A number of rapid tests were made and also some of long duration, the time of making these being recorded in the details.

Some bars were strained hot and subsequently ruptured cold, the stress applied exceeding the elastic limit at the higher temperature, and in some cases reached the tensile strength of the metal; the test being discontinued in the latter cases while the metal was stretching under the maximum load.

The elongations of the specimens under different stresses are given in the details of tests. These elongations, it will be understood, are approximations derived from micrometer observations made during the continuance of the tests upon the movements of the hydraulic holders of the testing machine, at a convenient distance from the muffle.

A correction for the readings thus obtained was determined at atmospheric temperatures by simultaneous measurements on the specimen and the hydraulic holders.

The elongations thus deduced give a close approximation of the general behavior of the metal under stress. In these and other tests at high temperatures it has appeared expedient to give prominence to some features, while at the same time acquiring as much information in other directions as practicable.

Observations were continued up to the time of reaching the maximum stress, and the stress at the time of rupture noted. The load at time of rupture was not obtained at some of the highest temperatures; the behavior of the metal seemed to indicate fracture in detail after local contraction had ceased, commencing at places below the surface within the contracted section. Evidence of this manner of fracture was obtained in one specimen of larger contraction of area by checking the

test immediately before final rupture, and after the bar cooled filing away the outside metal, which disclosed a cavity at the center of the bar.

The extent of local contraction was noted; that is, the distance each way from the place of fracture where the metal had contracted independent of the contraction of diameter incident to the general elongation.

If the elongation of the metal was strictly uniform up to the time local contraction began, there would be very little difficulty in identifying just the distance local contraction reaches each side of the fracture; as the metal generally behaves, the exact distance is somewhat vague.

Some knowledge, however, of the extent of local contraction is necessary in order to understand how much the general elongation of the metal is; which may be learned from the elongation of the inch sections beyond the reach of local contraction and the restraining influence of the enlarged area of the heads of the specimens.

Following the details of the tests are the results tabulated, and then diagrams showing graphically the principal features of the tests.

From these results it is seen that in general the tensile strength of the series of steel bars is higher at zero Fahr. than at the ordinary temperature of the testing room, 70° Fahr., and that the strength continues to decrease for a time as the temperature increases until a minimum is reached between the temperatures 200° and 300°.

Perhaps a larger number of tests made at closer intervals of temperature might modify these indications, but the results, as we find them, show the temperature of minimum strength to be somewhat higher for the higher carbon bars than for the milder grades of metal.

In speaking of the amount of carbon in the bars in connection with the results, it is merely to indicate which specimens are referred to and not intended to imply that the results are due wholly to the percentage of carbon present, as other elements are present in variable quantities, the effects of which are unknown.

From the temperature of this first minimum strength the bars display greater tenacity as higher temperatures are reached, and arrive at the maximum for any temperature yet experimented with at about 400° to 650° Fahr.

The higher carbon bars reach the temperature of maximum strength more abruptly, and retain their highest strength over a less range of temperature than the mild steel bars.

The greatest loss at the temperature of first minimum strength in percentage of the strength at 70° Fahr. is shown by steel marked 9–756, which was 6.5 per cent. at 295° Fahr.

The greatest gain in strength in per cent. of the bar at 70° was 25.8, as shown by steel marked 1–833 at 460° Fahr., although in total gain in pounds per square inch it was exceeded by steel marked 6–797 at the temperature of 587° Fahr., where the gain was 15,120 pounds per square inch, or 12.8 per cent.

The difference in strength of steel 6–797 between the temperatures 214° and 587° Fahr. is 21,200 pounds per square inch.

After passing the temperature of maximum tenacity the strengths of the several grades of metal decrease as the temperature increases; which is shown in the diagram by gradually converging lines.

The slope of the lines representing the highest carbon bars is greatest, nd while in general the bars which are strongest cold, remain in the ame relative position with reference to the others; yet, at the temperare of 1600° Fahr. they have approached each other, and range in ten-

sile strength between 10,000 and 20,000 pounds per square inch. At 70° Fahr. the range in tensile strength extends from 52,820 pounds per square inch to 155,400 pounds per square inch.

In the diagrams lines have been drawn through the points which represent the strength and temperature of individual tests. Where two specimens were tested at nearly the same temperature, and varying in strength, a medial line is shown, with the strength of the specimens indicated by round dots on the diagram. or in the absence of the dots a cross is used to show that the curve at that point is the mean of two tests.

Diagrams 2 to 11, inclusive, show curves of elastic limit, tensile strength, and stress on the ruptured section for each grade of steel.

It appears that the elastic limit diminishes as the temperature increases throughout the series.

The elastic limit in these tests has been established as that load at which a decided change in the rate of elongation begins.

With the mild grades of steel, and particularly at those temperatures at which yielding continues under loads lower than those the metal had previously sustained, there is very little difficulty experienced in identifying the load at the elastic limit according to this definition.

With hard metal there is not so pronounced a difference in the rate of elongation at any load, and there is a corresponding uncertainty where to place the elastic limit.

The expression "elastic limit," in fact, is used to indicate the first decided change in the rate of elongation which occurs under increasing stresses, instead of that meaning of the term which might be taken to signify the maximum load which does not cause permanent set.

Under higher temperatures efforts to identify even an approximate elastic limit yield results more or less unsatisfactory.

With this brief explanation it is not thought that misunderstanding will arise, nor that statements of elastic limit here given will be taken to signify beyond what is intended.

The curves of stress on the ruptured section bear, for the most part, a general resemblance to the curves of tensile strength. This feature of the test may be modified by differences in rate of application of stress.

The behavior of a number of individual specimens is shown by diagrams 12 to 21, inclusive. From these and the details of the tests it will be seen that at certain temperatures, between zero and 545° Fahr., the several grades of metal exhibit decided yielding under loads which are in the vicinity of the elastic limit, and the stretch is continued after this rapid yielding is begun under reduced loads. In the milder steels this is a more prominent feature than in the harder metal.

As the temperature is increased the metal loses this tendency, and a gradual increase in the elongation then accompanies the application of each higher load.

Remarkable phenomena are displayed in the vicinity of 200° to 400° Fahr.; at intervals throbs are felt, at which time there are periods of relaxation of the metal, and rapid stretch without increase of load, or even under slightly reduced loads, followed by periods of abnormal rigidity.

Specimen No. 1747, .20 per cent. carbon at 437° Fahr., and specimen No. 1755, .31 per cent. carbon at 223° Fahr., are striking examples of this peculiar behavior. Attention was called to this behavior in an earlier report while describing the observations made upon the contractile force of some wrought-iron bars when they were cooled from high temperatures.

Hence we observe the same phenomena under rising and under falling temperatures, and also note the fact that this unstable condition under stress occurs at the time in which the metal under rising temperatures is gaining in strength.

The details, and the diagrams constructed therefrom, show the steels possess greater rigidity; that is, have less elongation under stress at temperatures between 300° and about 650° Fahr. than when tested at either higher or lower temperatures, so far as relates to those parts of the curves which are between loads somewhat exceeding the elastic limits and up to the tensile strength of the metal.

The influence of the temperature of the metal on the contraction of area is shown, although individual cases exhibit variations from mean results. Diagrams 22 and 23 were constructed to show this feature in a connected manner, in which we see a general tendency to fracture with less contraction of area up to a temperature of 400° to 600° Fahr.

In the vicinity of this range of temperature a number of the bars fractured obliquely across their stems, the fractures of which at higher or lower temperatures were square across.

This behavior is significant, inasmuch as it appears to connect the tensile tests with the brittleness observed at these temperatures in bending tests.

After passing the temperature of minimum contraction there is a gradual increase in this value up to the highest temperatures reached; one bar (No. 1782) of steel, marked 4–795, reached a contraction of 98.9 per cent. This bar was fractured at the temperature of 1572° Fahr.

Bars marked 8–750, 9–756, and 10–334 are peculiar in showing a stage of diminished contraction at 1100 to 1200° Fahr. These bars also form a group by themselves as regards tensile strength, and shown by the curves on diagram No. 1.

Although the contraction of area reached highest values at the most elevated temperatures, yet the general elongation was less than at moderate temperatures. An examination of the elongation of the inch sections measured after fracture will best show this fact.

In the tabulated results is a column stating the elongation at the time the maximum tensile stress was reached, which approximately indicates the general elongation; not however strictly so, because even with a slow application of stress there takes place some local contraction before the load sensibly diminishes, which makes the general elongation appear too large in a short specimen.

In addition to the tests made at a fairly uniform rate of speed, other tests were made in which rupture was caused in a few seconds of time, or at least the time in reaching the maximum stress was from two to eight seconds.

From the temperature of the testing room to about 600° the observable variation in strength was slight; from this temperature upwards the strength of the bars in the rapid tests much exceeded the strength of the slowly ruptured bars.

These observations were confined to hard metal which does not have large ductility at lower temperatures. The same kind of tests will be made, using metal which is ductile at atmospheric temperatures.

Diagram No. 9 shows the plotted results of rapid tests of steel bars, marked 8–750. At the temperature of 1410° the ordinary test exhibited a tensile strength of 33,240 pounds per square inch, whereas at the same temperature a bar tested in two seconds showed 63,000 pounds per square inch. This is an extreme example of the difference in apparent tensile strength at elevated temperatures between moderate and rapid tests.

Among the details of the tests will be found bars which, on the other hand, have been exposed to stresses for longer periods of time than employed in the ordinary tests, the interval under stress being stated in the column of remarks.

Loads within the elastic limit produce their full effects at once, so far as observable elongation is concerned; after this limit is passed there is sluggishness in responding to the influence of stress, requiring considerable time to overcome.

The rate of flow, however, increases with the stress, and before the maximum stress is reached a greater elongation is produced by a load acting one minute than the immediate elongation due an increased load of, say, 1,000 pounds per square inch or more.

Fracture has been reached after long exposure of the metal to a constant stress, in which experiment the rate of elongation continued practically uniform for upwards of an hour, after which the rate augmented and became very rapid immediately preceding rupture.

The effect of straining hot upon the tensile strength of bars subsequently ruptured cold was determined at different temperatures, and under different loads.

Diagrams Nos. 24 to 27 exhibit many of the results of this class. The tensile stress applied to the bar when hot is reduced to pounds per square inch on the basis of the original sectional area of the bar, and on the same basis one set of figures give the elastic limit and tensile strength when ruptured cold.

The elastic limit and tensile strength is also given in pounds per square inch referred to the minimum section measured at the completion of the hot test. If the sectional area was not much reduced locally these two sets of figures do not differ largely.

The distinction here made between the stress per square inch on the reduced area of the hot strained bar and the stress on the ruptured section of the bar at the time of fracture, as given in other tests, will be recognized.

The results with bars marked 7–823 show that overstraining with stresses exceeding the elastic limits of the bars, both at the temperature then employed and when cold, materially elevates the elastic limit when cooled, but without producing sensible effect on the tensile strength.

If, however, the straining load on the hot bar approaches the tensile strength, the bar when cooled may have a tensile strength exceeding the ordinary cold test; examples are furnished in bars Nos. 1780 and 1882 of steel 4–795, No. 1889 of steel 6–797, and Nos. 1969 and 1970 of steel 10–334. These tests are included in the range of temperature between 335° and 740° Fahr.

As higher temperatures are reached there is a marked reduction in both elastic limit and tensile strength of the cooled bar. Bars marked 10–334 furnish most of the examples belonging to the highest temperatures, and this grade of steel exhibits greater reduction than bars of lower carbon. The annealing effect of high temperature is probably a factor in producing these results.

There were intervening periods of rest between the time of hot straining and of fracture, which are stated in the details.

The moduli of elasticity were computed for the overstrained hot bars from observations made when cooled to 70° Fahr. For the computations of these moduli the mean sectional areas of the bars were used, determining the mean areas from the elongations of the stems, assuming the volumes of the specimens remained unchanged.

It is not evident that any decided change in the modulus of elasticity

results from overstraining the metal when it is hot, although several bars show results slightly below average values.

These hot bars had varying periods of rest between the times of hot straining and the observations made when cold.

It has been shown in earlier tests that overstraining of some wrought-iron and steel bars at atmospheric temperatures effected a temporary reduction in the modulus of elasticity from which there was a recovery after a period of rest.

Wrought-iron bars marked A and B and specimens from muck-bar axle No. 5 behaved in a similar manner to the mild steel bars.

Bars A were remarkable for the high elastic limit and tensile strength reached, and in not showing evidence of being red-short until the highest temperature, 1568° Fahr., was reached, at which time the metal began to show signs of crumbling under stress.

The cast-iron bars displayed increased tenacity as the temperature increased, and retained this tendency up to higher temperatures than the wrought-iron and steel bars. Not until after 900° Fahr. was exceeded was there a reduction in strength. Under the highest temperatures reached this metal began to crack in numerous places along the surface of the stem.

The description of the color of the surfaces of the stems and fractured surfaces refer to the appearance of the metal after it had cooled.

SPECIFIC GRAVITY OF STEEL BARS.

DETERMINATIONS OF METAL TAKEN FROM THE VICINITY OF FRACTURES OF HOT BARS.

Tensile test.		Marks.	Length.	Diameters.		Specific gravity.
Number.	Temperature.			Large end.	Small end.	
	Degrees Fahr.		*Inch.*	*Inch.*	*Inch.*	
1770	0	1-833	.81	.69	.48	7.8470
1859	195	1-833	.82	.72	.51	7.8541
1860	460	1-833	.82	.72	.57	7.8592
1861	934	1-833	.81	.64	.43	7.8487
1862	1235	1-833	.82	.66	.25	7.8563
1771	0	2-123	.81	.71	.63	7.8479
1863	201	2-123	.81	.73	.62	7.8542
1745	384	2-123	.81	.75	.64	7.8583
1746	545	2-123	.81	.76	.70	7.8619
1749	668	2-123	.80	.73	.66	7.8594
1743	1176	2-123	.81	.68	.38	7.8524
1750	1397	2-123	.81	.66	.35	7.8512
1867	1572	2-123	.81	.65	.23	7.8502
1774	0	5-803	.82	.73	.58	7.8246
1784	503	5-803	.82	.73	.70	7.8376
1787	594	5-803	.81	.73	.69	7.8398
1883	712	5-803	.81	.74	.55	7.8339
1884	1113	5-803	.81	.71	.49	7.8256
1786	1319	5-803	.81	.76	.47	7.8369
1776	0	7-823	.81	.75	.71	7.8297
1927	335	7-823	.81	.74	.71	7.8307
1928	421	7-823	.81	.74	.71	7.8289
1924	1024	7-823	.81	.75	.57	7.8270
1921	1158	7-823	.81	.72	.53	7.8222
1925	1503	7-823	.79	.69	.36	7.8198
1922	1627	7-823	.82	.65	.23	7.8268
1957	0	10-334	.82	.76	.75	7.8082
1971	70	10-334	.81	.76	.75	7.8020
1969	478	10-334	.81	.77	.76	7.8097
1970	535	10-334	.81	.78	.76	7.8073
1968	781	10-334	.85	.76	.76	7.8096
1967	1362	10-334	.81	.78	.74	7.8126
1966	1505	10-334	.79	.77	.70	7.8084
1956	1689	10-334	.80	.74	.68	7.8001
1964	1694	10-334	.81	.75	.71	7.8025

DETAILS OF TENSILE TESTS.

No. 1770.

Marks, 1–833.
Diameter, ″.798.
Sectional area, .50 square inch.
Temperature, 0° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
2,000	4,000	.0036	.....	
10,000	20,000	.0035	.....	
15,000	30,000	.0073	.....	
15,500	31,000	.0076	.....	
16,000	32,000	.0078	.....	
16,500	33,000	.0080	.....	
17,000	34,000	.0082	.....	
17,500	35,000	.0081	.....	Elastic limit.
18,000	36,000	.0100	.....	
		.0325	.....	
18,500	37,000	.0455	.....	
19,000	38,000	.1578	.....	
19,500	39,000	.1658	.....	
20,000	40,000	.1796	.....	
21,000	42,000	.195	.....	
22,000	44,000	.23	.....	
23,000	46,000	.275	.....	
24,000	48,000	.335	.....	
25,000	50,000	.40	.....	
26,000	52,000	.49	.....	
27,000	54,000	.65	.....	
27,680	55,300	1.08	.....	Tensile strength.
19,500	117,470	.....	.....	At time of rupture.
0	0	1.71	.....	=34.2 per cent.

Fractured 2″.75 from neck. Appearance, silky.
Local contraction, 1″.6 each side of fracture.
Diameter at fracture, ″.46. Area, ″.166 square inch. Contraction, 66.8 per cent.
Elongation of inch sections, ″.20, ″.25, ″.59*, ″.45, ″.22.

No. 1807.

Marks, 1–833.
Diameter, ″.798.
Sectional area, .50 square inch.
Temperature, 70° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
5,000	10,000	.0012	.....	
10,000	20,000	.0028	.....	
15,000	30,000	.0044	.....	
15,500	31,000	.0046	.....	
16,000	32,000	.0047	.....	
16,500	33,000	.0049	.....	Elastic limit.
Load fell.				
15,000	30,000	.0121	.....	
16,000	32,000	.0972	.....	
17,000	34,000	.115	.....	
18,000	36,000	.135	.....	
19,000	38,000	.17	.....	
20,000	40,000	.20	.....	
21,000	42,000	.24	.....	
22,000	44,000	.29	.....	
23,000	46,000	.355	.....	
24,000	48,000	.42	.....	
25,000	50,000	.535	.....	
26,000	52,000	.81	.....	
26,410	52,820	1.18	.....	Tensile strength.
18,100	169,040	.....	.....	At time of fracture.
0	0	1.72	.....	=34.4 per cent.

Fractured 3″ from neck. Appearance, silky.
Diameter at fracture, ″.46. Area, .166 square inch. Contraction, 66.8 per cent.
Elongation of inch sections, ″.20, ″.26, ″.69*, ″.36, ″.21.

No. 1859.

Marks, 1–833.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0050 in 6 inches.
Estimated temperature, 195° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
14,000	28,000	.0023	.....	
15,000	30,000	.0026	.....	
16,000	32,000	.0029	.....	
16,100	32,200	.....	.....	Elastic limit.
Load fell.				
14,500	29,000	.0221	.....	
15,000	30,000	.0826	.....	
16,000	32,000	.0834	.....	
17,000	34,000	.1102	.....	
18,000	36,000	.1160	.....	
19,000	38,000	.1495	.....	
20,000	40,000	.1755	.....	
21,000	42,000	.2095	.....	
22,000	44,000	.2595	.....	
23,000	46,000	.3229	.....	
25,000	50,000	.62	.....	
25,680	51,360	1.13	.....	Tensile strength.
18,500	102,210	.....	.....	At time of fracture.
0	0	1.35	.....	= 27.0 per cent.

Fractured at middle of stem. Appearance, silky; no change in color. Cup-shaped end. Surface of stem pale yellow color.

Local contraction 1″ each side of fracture.

Diameter at fracture, ″.48. Area, .181 square inch. Contraction, 63.8 per cent.

Elongation of inch sections, ″.15, ″.19, ″.64*, ″.21, ″.16.

No. 1740.

Marks, 1–833.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0107 in 6 inches.
Estimated temperature, 334° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
5,000	10,000	.0003	.....	
10,000	20,000	.0011	.....	
13,000	26,000	.0016	.....	
14,000	28,000	.0021	.....	
14,500	29,000	.0026	.....	Elastic limit.
15,000	30,000	.0080	.....	
		.0535	.....	
15,500	31,000	.0607	.....	
16,000	32,000	.0614	.....	
18,000	36,000	.0762	.....	
20,000	40,000	.0840	.....	Throbs.
22,000	44,000	.1302	.....	
24,000	48,000	.1547	.....	
26,000	52,000	.20	.....	
28,000	56,000	.30	.....	
30,000	60,000	.40	.....	
31,000	62,000	.41	.....	Tensile strength.
30,000	.....	.83	.....	
29,000	.....	.91	.....	
25,000	113,120	.....	.....	At time of fracture.
0	0	1.02	.....	= 20.4 per cent.

Fractured 1″.35 from neck Appearance, silky.
Local contraction, ″.8 each side of fracture.
Diameter at fracture, ″.53. Area, .221 square inch. Contraction, 55.8 per cent.
Elongation of inch sections: ″.37*, ″.27, ″.15, ″.12, ″.11.

No. 1860.

Marks, 1–833.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0158 in 6 inches.
Estimated temperature 460° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
5,000	10,000	.0021	.....	
10,000	20,000	.0046	.....	
11,000	22,000	.0050	.....	
12,000	24,000	.0059	.....	
12,900	25,800	.....	.....	Elastic limit.
		Load fell.		
12,000	24,000	.0217	.....	
13,000	26,000	.0282	.....	
14,000	28,000	.0387	.....	
15,000	30,000	.0496	.....	
16,000	32,000	.0595	.....	
18,000	36,000	.0758	.....	
20,000	40,000	.0948	.....	
22,000	44,000	.1203	.....	
24,000	48,000	.1453	.....	
26,000	52,000	.1758	.....	
28,000	56,000	.2238	.....	
30,000	60,000	.2948	.....	
31,000	62,000	.345	.....	
32,000	64,000	.41	.....	
33,000	66,000	.605	.....	
33,200	66,400	.71	.....	
33,220	66,440	.79	.....	Tensile strength.
24,900	108,730	.....	.....	At time of fracture.
0	0	1.28	.....	= 25.6 per cent.

Fractured, 3″ from neck. Appearance, silky; no change in color. Surface of stem, straw color.

Local contraction, ″.9 each side of fracture.

Diameter at fracture, ″.54. Area, .229 square inch. Contraction, 54.2 per cent.

Elongation of inch sections: ″.15, ″.20, ″.53,* ″.25, ″.15.

No. 1742.

Marks, 1–833.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0171 in 6 inches.
Estimated temperature, 492° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
10,000	20,000	.0007	.....	
11,000	22,000	.0008	.....	
11,500	23,000	.0014	.....	
12,000	24,000	.0016	.....	
12,500	25,000	.0024	.....	Elastic limit.
13,000	26,000	.0064	.....	
Load fell.				
12,000	24,000	.0161	.....	
13,000	26,000	.0226	.....	
14,000	28,000	.0339	.....	
15,000	30,000	.0468	.....	
16,000	32,000	.0562	.....	
18,000	36,000	.0705	.....	
20,000	40,000	.0885	.....	
22,000	44,000	.1115	.....	
24,000	48,000	.14	.....	
26,000	52,000	.17	.....	
28,000	56,000	.22	.....	
29,000	58,000	.26	.....	
30,000	60,000	.29	.....	
31,000	62,000	.37	.....	
32,000	64,000	.40	.....	
32,280	64,560	.46	.....	Tensile strength.
30,000	.....	.78	.....	
26,100	118,100	.....	.....	At time of rupture.
0	0	.98		= 18.6 per cent.

Fractured 1″.40 from neck. Appearance, silky; faint straw color. Surface of stem, straw colored.

Local contraction ″.9 each side of fracture.

Diameter at fracture, ″.53. Area, .221 square inch. Contraction, 55.8 per cent.

Elongation of inch sections: ″.20, ″.42*, ″.12, ″.12, ″.10, ″.09.

No. 1741.

Marks, 1–833.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0221 in 6 inches.
Estimated temperature, 616° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
8,000	16,000	.0014	.....	
9,000	18,000	.0021	.....	Elastic limit.
9,500	19,000	.0036	.....	
10,000	20,000	.0059	.....	
10,500	21,000	.0086	.....	
11,000	22,000	.0118	.....	
11,500	23,000	.0162	.....	
12,000	24,000	.0209	.....	
13,000	26,000	.0276	.....	
14,000	28,000	.0366	.....	
16,000	32,000	.0587	.....	
18,000	36,000	.0810	.....	
20,000	40,000	.0980	.....	
22,000	44,000	.1240	.....	
24,000	48,000	.145	.....	
26,000	52,000	.17	.....	
28,000	56,000	.23	.....	
29,000	58,000	.27	.....	
30,000	60,000	.29	.....	
31,000	62,000	.34	.....	
32,000	64,000	.44	.....	
32,600	65,200	.54	.....	Tensile strength.
26,500	115,720	.....	.....	At time of rupture.
0	0	.88	.....	=17.6 per cent.

Fractured ″.80 from neck. Appearance, silky; faint straw color. Surface of stem varies from purple to blue.

Local contraction reaches to the neck and 1″ from fracture.

Diameter at fracture, ″.54. Area, .229 square inch. Contraction, 54.2 per cent.

Elongation of inch sections: ″.10, ″.10, ″.10, ″.13, ″.45*.

No. 1735.

Marks, 1–833.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0280 in 6 inches.
Estimated temperature, 731° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
11, 500	23, 000	.....	.....	Elastic limit.
20, 000	40, 000	.16	.....	
21, 000	42, 000	.18	.....	
22, 000	44, 000	.215	.....	
23, 000	46, 000	.255	.....	
24, 000	48, 000	.30	.....	
25, 000	50, 000	.36	.....	
26, 000	52, 000	.45	.....	
26, 500	53, 000	.55	.....	
27, 000	54, 000	.68	.....	
27, 080	54, 160	.81	.....	Tensile strength.
16, 000	88, 400	.....	.....	At time of fracture.

Fractured ″.80 from neck. Appearance, silky; blue, black color.
Surface of stem, blue black, interspersed with darker spots.
Local contraction reaches to the neck and 1″.1 from fracture.
Mean diameter of stem away from place of rupture, ″.75 = .442 square inch.
Diameter at fracture, ″.48. Area, .181 square inch.
Contraction, 63.8 per cent.

No. 1739.

Marks, 1–833.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0314 in 6 inches.
Estimated temperature, 845° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
7,000	14,000	.0014	.....	
8,000	16,000	.0025	.....	
8,500	17,000	.0031	.....	Elastic limit.
9,000	18,000	.0048	.....	
9,500	19,000	.0068	.....	
10,000	20,000	.0092	.....	
10,500	21,000	.0121	.....	
11,000	22,000	.0157	.....	
12,000	24,000	.0244	.....	
13,000	26,000	.0341	.....	
14,000	28,000	.0459	.....	
15,000	30,000	.0603	.....	
16,000	32,000	.0757	.....	
17,000	34,000	.0869	.....	
18,000	36,000	.1000	.....	
19,000	38,000	.1174	.....	
20,000	40,000	.1390	.....	
21,000	42,000	.165	.....	
22,000	44,000	.19	.....	
23,000	46,000	.215	.....	
24,000	48,000	.255	.....	
25,000	50,000	.30	.....	
26,000	52,000	.35	.....	
27,000	54,000	.44	.....	
28,000	56,000	.61	.....	
28,620	57,240	.95	.....	Tensile strength.
18,800	103,870	.....	.....	At time of rupture.
0	0	1.45	.....	= 29.0 per cent.

Fractured 1″.10 from neck. Appearance, silky. Surfaces of fracture and stem, dark blue color.

Local contraction, 1″ each side of fracture.

Diameter at fracture, ″.48. Area, .181 square inch. Contraction, 63.8 per cent.

Elongation of inch sections: ″.64*, ″.26, ″.19, ″.19, ″.17.

No. 1861.

Marks, 1–833.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0350 in 6 inches.
Estimated temperature, 934° Fahr.
Ganged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1, 000	2, 000	0.	0.	Initial load.
7, 000	14, 000	.0014	.....	
8, 000	16, 000	.0035	.....	Elastic limit.
9, 000	18, 000	.0071	.....	
10, 000	20, 000	.0135	.....	
11, 000	22, 000	.0233	.....	
12, 000	24, 000	.0340	.....	
13, 000	26, 000	.0494	.....	
14, 000	28, 000	.0670	.....	
15, 000	30, 000	.0889	.....	
16, 000	32, 000	.1184	.....	
17, 000	34, 000	.1428	.....	
18, 000	36, 000	.1876	.....	
19, 000	38, 000	.2510	.....	
20, 000	40, 000	.3716	.....	
		.4266	.....	
20, 980	41, 960	.635	.....	
		.845	.....	
21, 400	42, 800	1.13	.....	Tensile strength.
		1.37 *	.....	
11, 600	92, 060	.....	.....	At time of fracture.
0	0	2.28	.....	= 45.6 per cent.

Fractured 2″.70 from neck. Appearance, silky. Surfaces of fracture and stem, blue-black.

Local contraction, 1″ each side of fracture.

Diameter at fracture, ″.40. Area, .126 square inch. Contraction, 74.8 per cent.

Elongation of inch sections: ″.21, ″.31, ″.45, ″.99*, ″.32.

No. 1738.

Marks, 1–833.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0385 in 6 inches.
Estimated temperature, 1,021° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
2,000	4,000	0.	0.	Initial load.
3,000	6,000	.0008	.....	Elastic limit.
4,000	8,000	.0029	.....	
5,000	10,000	.0053	.....	
6,000	12,000	.0113	.....	
7,000	14,000	.0189	.....	
7,500	15,000	.0301	.....	
8,000	16,000	.0452	.....	
		.0607	.....	
8,500	17,000	.0984	.....	
9,000	18,000	.1380	.....	
9,500	19,000	.2236	.....	
9,600	19,200	.33	.....	Tensile strength.
0	0	1.31	.....	=26.2 per cent.

Fractured 2″.25 from neck. Appearance, silky. Fracture and surface of stem, blue-black color.

Local contraction, 1″.6 each side of fracture.*

Diameter at fracture, ″.24. Area, .0452 square inch. Contraction, 90.9 per cent.

Elongation of inch sections: ″.12, 1″.03*, ″.12, ″.03, ″.01.

No. 1737.

Marks, 1–833.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0395 in 6 inches.
Estimated temperature, 1,045° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
2,000	4,000	.0014	.....	
3,000	6,000	.0027	.....	
4,000	8,000	.0039	.....	Elastic limit.
5,000	10,000	.0052	.....	
6,000	12,000	.0067	.....	
7,000	14,000	.0133	.....	
7,500	15,000	.0194	.....	
8,000	16,000	.0230	.....	
8,500	17,000	.0331	.....	
9,000	18,000	.0418	.....	
9,500	19,000	.0529	.....	
10,000	20,000	.0790	.....	
10,500	21,000	.0867	.....	
11,000	22,000	.1213	.....	
11,500	23,000	.1610	.....	
12,000	24,000	.22	.....	
12,500	25,000	.50	.....	Tensile strength.
0	0	1.43	.....	= 28.6 per cent.

Fractured 2″.25 from neck. Appearance, silky; dark blue color.
Surface of stem, dark blue, with darker spots.
Local contraction, 1″.5 each side of fracture.
Diameter at fracture, ″.29. Area, .066 square inch. Contraction, 86.8 per cent.
Elongation of inch sections: ″.05, ″.10, ″.23, ″.98*, ″.09.

No. 1862.

Mark, 1–833.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0472 in 6 inches.
Estimated temperature, 1,235° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
2,000	4,000	.0001	.....	
3,000	6,000	.0012	.....	
3,500	7,000	.0022	.....	
4,000	8,000	.0033	.....	Elastic limit (not well defined).
4,500	9,000	.0054	.....	
5,000	10,000	.0093	.....	
5,500	11,000	.0185	.....	
6,000	12,000	.0321	.....	
6,500	13,000	.0516	.....	
7,000	14,000	.0736	.....	
7,500	15,000	.1064	.....	
8,000	16,000	.1914	.....	
8,500	17,000	.2781	.....	
8,720	17,440	.42	.....	Tensile strength.
0	0	1.68	.....	= 33.6 per cent.

Fractured 2″.5 from neck. Appearance, silky; dark blue color. Surface of stem, dark blue.

Local contraction, 1″.6 and 2″ from fracture.

Diameter at fracture, ″.24. Area, .045 square inch. Contraction, 91.0 per cent.

Elongation of inch sections: ″.04, ″.08, ″.33, 1″.09*, ″.11.

No. 1771.

Marks, 2–123.
Diameter, ″.798.
Sectional area, .50 square inch.
Temperature, 0° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
2,000	4,000	.0010	.....	
10,000	20,000	.0023	.....	
15,000	30,000	.0045	.....	
16,000	32,000	.0049	.....	
17,000	34,000	.0053	.....	
18,000	36,000	.0055	.....	
19,000	38,000	.0058	.....	
20,000	40,000	.0057	.....	
21,000	42,000	.0062	.....	Elastic limit.
		.0444	.....	
21,500	43,000	.0929	.....	
22,000	44,000	.0994	.....	
23,000	46,000	.1069	.....	
24,000	48,000	.1206	.....	
25,000	50,000	.1354	.....	
26,000	52,000	.1498	.....	
27,000	54,000	.1650	.....	
28,000	56,000	.185	.....	
29,000	58,000	.21	.....	
30,000	60,000	.235	.....	
31,000	62,000	.265	.....	
32,000	64,000	.305	.....	
33,000	66,000	.355	.....	
34,000	68,000	.435	.....	
35,000	70,000	.545	.....	
36,000	72,000	.835	.....	
36,050	72,100	.915	.....	Tensile strength.
31,700	116,120	.....	.....	At time of rupture.
0	0	1.31	.....	= 26.2 per cent.

Fractured at middle of stem. Appearance, silky.
Local contraction, ″.9 each side of fracture.
Diameter at fracture, ″.59. Area, .273 square inch. Contraction, 45.4 per cent.
Elongation of inch sections: ″.17, ″.25, ″.49*, ″.23, ″.17.

No. 1808.

Marks, 2–123.
Diameter, ″.798.
Sectional area, .50 square inch.
Temperature, 70° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
5,000	10,000	.0013	.....	
10,000	20,000	.0030	.....	
15,000	30,000	.0047	.....	
16,000	32,000	.0051	.....	
17,000	34,000	.0054	.....	
18,000	36,000	.0057	.....	
19,000	38,000	.0061	.....	Elastic limit.
Load fell.				
18,000	36,000	.0110	.....	
19,000	38,000	.0688	.....	
20,000	40,000	.0768	.....	
21,000	42,000	.0885	.....	
22,000	44,000	.1028	.....	
23,000	46,000	.1180	.....	
24,000	48,000	.1341	.....	
25,000	50,000	.15	.....	
26,000	52,000	.175	.....	
27,000	54,000	.20	.....	
28,000	56,000	.225	.....	
29,000	58,000	.26	.....	
30,000	60,000	.295	.....	
31,000	62,000	.34	.....	
32,000	64,000	.40	.....	
33,000	66,000	.48	.....	
34,000	68,000	.61	.....	
34,590	69,000	.77	.....	
34,590	69,180	.....	.....	Tensile strength.
0	0	1.31	.....	=26.2 per cent.

Fractured 1″.60 from neck. Appearance, silky.
Diameter at fracture, ″.61. Area, .292 square inch. Contraction, 41.6 per cent.
Elongation of inch sections: ″.23, ″.48*, ″.23, ″.21, ″.16.

No. 1863.

Marks, 2-123.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0052 in 6 inches.
Estimated temperature, 201° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
5,000	10,000	.0010	.....	
10,000	20,000	.0028	.....	
15,000	30,000	.0048	.....	
16,000	32,000	.0051	.....	
17,000	34,000	.0053	.....	
18,000	36,000	.0056	.....	
18,700	37,400	.....	.....	Elastic limit.
Load fall.				
17,000	34,000	.0148	.....	
17,500	35,000	.0490	.....	
18,000	36,000	.0835	.....	
19,000	38,000	.0848	.....	
20,000	40,000	.0819	.....	
22,000	44,000	.1093	.....	
24,000	48,000	.1423	.....	
26,000	52,000	.1838	.....	
28,000	56,000	.2457	.....	
30,000	60,000	.3452	.....	
31,000	62,000	.36	.....	
31,600	63,200	.465	.....	
32,000	64,000	.495	.....	
32,780	65,560	.63	.....	
33,000	66,000	.70	.....	
33,220	66,440	.785	.....	Tensile strength.
28,700	112,500	.....	.....	At time of fracture.
0	0	1.01	.....	=20.2 per cent.

Fractured 1″.20 from neck. Appearance, silky; no change in color. Surface of stem, light straw color.

Local contraction, 1″.2 each side of fracture.

Diameter at fracture, ″.58. Area, .264 square inch. Contraction, 47.2 per cent.

Elongation of inch sections: ″.12, ″.14, ″.15, ″.23, ″.37*.

No. 1748.

Marks, 2–123.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0094 in 6 inches.
Estimated temperature, 306° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
5,000	10,000	.0003	.....	
10,000	20,000	.0014	.....	
11,000	22,000	.0020	.....	
12,000	24,000	.0023	.....	
13,000	26,000	.0025	.....	
14,000	28,000	.0028	.....	
15,000	30,000	.0032	.....	
16,000	32,000	.0033	.....	
17,000	34,000	.0036	.....	Elastic limit.
17,500	35,000	.0088	.....	
		.0130	.....	
Load fell.				
17,000	34,000	.0351	.....	
18,000	36,000	.0574	.....	
21,000	42,000	.0641	.....	
22,000	44,000	.0848	.....	
23,000	46,000	.0856	.....	
24,000	48,000	.0959	.....	Throbs.
25,000	50,000	.1002	.....	
26,000	52,000	.1221	.....	
27,000	54,000	.13	.....	
28,000	56,000	.15	.....	
29,000	58,000	.17	.....	
30,000	60,000	.19	.....	
31,000	62,000	.205	.....	
32,000	64,000	.25	.....	
33,000	66,000	.27	.....	
34,000	68,000	.31	.....	
34,700	69,400	.....	.....	Tensile strength.
0	0	.63	.....	=12.6 per cent.

Fractured 1″.20 from neck. Appearance, silky; oblique 46°. No change in color.

Surface of stem, pale straw color.

Local contraction reaches 1″ each side of fracture.

Diameter at fracture, ″.62. Area, .302 square inch. Contraction, 39.6 per cent.

Elongation of inch sections: ″.30*, ″.14, ″.07, ″.06, ″.06.

No. 1745.

Marks, 2–123.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0125 in 6 inches.
Estimated temperature, 384° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
5,000	10,000	—.0001	.....	
10,000	20,000	.0009	.....	
11,000	22,000	.0012	.....	
12,000	24,000	.0016	.....	
13,000	26,000	.0018	.....	
14,000	28,000	.0022	.....	
15,000	30,000	.0022	.....	
16,000	32,000	.0026	.....	
17,000	34,000	.0027	.....	
17,800	35,000	.0028	.....	Elastic limit.
18,000	36,000	.0125	.....	
Load fell.				
17,000	34,000	.0437	.....	
18,000	36,000	.0455	.....	
18,500	37,000	.0460	.....	
19,000	38,000	.0461	.....	
19,500	39,000	.0469	.....	
20,000	40,000	.0486	.....	
20,500	41,000	.0514	.....	
21,000	42,000	.0567	.....	
22,000	44,000	.0765	.....	
23,000	46,000	.0875	.....	
25,000	50,000	.0973	.....	
26,000	52,000	.0981	.....	
27,000	54,000	.1289	.....	Throbs.
29,000	58,000	.1289	.....	
30,000	60,000	.1729	.....	
31,000	62,000	.18	.....	
32,000	64,000	.185	.....	
33,000	66,000	.185	.....	
34,000	68,000	.19	.....	
		.27	.....	
35,000	70,000	.40	.....	
36,000	72,000	.41	.....	
37,000	74,000	.41	.....	Tensile strength.
34,000	112,580	.....	.....	Load at time of rupture.
0	0	.75	.....	= 15.0 per cent.

Fractured 2″.70 from neck. Appearance, silky; no change in color. Surface of stem, pale straw colored.

Local contraction reaches 1″ each side of the place of rupture.

Diameter at fracture, ″.62. Area, .302 square inch. Contraction, 39.6 per cent.

Elongation of inch sections: ″.06, ″.10, ″.37*, ″.13, ″.09.

No. 1747.

Marks, 2–123.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion ″.0146 in 6 inches.
Estimated temperature, 437° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
5,000	10,000	.0002	.....	
10,000	20,000	.0012	.....	
11,000	22,000	.0016	.....	
12,000	24,000	.0018	.....	
13,000	26,000	.0022	.....	
14,000	28,000	.0023	.....	
15,000	30,000	.0024	.....	
16,000	32,000	.0027	.....	
17,000	34,000	.0028	.....	
17,500	35,000	.0028	.....	
17,800	35,600	.0036	.....	Elastic limit.
Load fell.				
17,000	34,000	.0160	.....	
17,500	35,000	.0398	.....	
18,000	36,000	.0401	.....	
18,500	37,000	.0402	.....	
19,000	38,000	.0404	.....	
20,000	40,000	.0529	.....	
21,000	42,000	.0536	.....	
22,000	44,000	.0673	.....	
23,000	46,000	.0691	.....	Throbs, accompanied by muffled sounds.
24,000	48,000	.0820	.....	
26,000	52,000	.0995	.....	
27,000	54,000	.1005	.....	
28,000	56,000	.1087	.....	
29,000	58,000	.1137	.....	
30,000	60,000	.1467	.....	
31,000	62,000	.15	.....	
32,000	64,000	.15	.....	
33,000	66,000	.20	.....	
34,000	68,000	.21	.....	
35,000	70,000	.23	.....	
36,000	72,000	.27	.....	
37,000	74,000	.28	.....	
38,000	76,000	.54	.....	
38,700	77,400	.56	.....	Tensile strength.
35,200	112,320	.....	.....	Load at time of rupture.
0	0	.88	.....	=16.6 per cent.

Fractured 1″ from neck. Appearance, silky; oblique 53°. No change in color.

Surface of stem, straw colored.

Local contraction reaches ″.80 each side of the place of rupture.

Diameter at fracture, ″.63. Area, .312 square inch. Contraction, 37.6 per cent.

Elongation of inch sections: ″.29*, ″.17, ″.13, ″13, ″11.

No. 1746.

Marks, 2–123.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0189 in 6 inches.
Estimated temperature, 545° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
5,000	10,000	.0002	.....	
10,000	20,000	.0010	.....	
11,000	22,000	.0014	.....	
12,000	24,000	.0018	.....	
13,000	26,000	.0020	.....	
14,000	28,000	.0024	.....	
15,000	30,000	.0028	.....	Elastic limit.
16,000	32,000	.0049	.....	
Load fell.				
15,000	30,000	.0173	.....	
15,500	31,000	.0203	.....	
16,000	32,000	.0227	.....	
17,000	34,000	.0273	.....	
18,000	36,000	.0336	.....	
19,000	38,000	.0425	.....	
20,000	40,000	.0492	.....	
21,000	42,000	.0565	.....	
22,000	44,000	.0636	.....	
23,000	46,000	.0746	.....	
24,000	48,000	.0821	.....	
25,000	50,000	.0874	.....	
26,000	52,000	.0953	.....	
27,000	54,000	.1020	.....	
28,000	56,000	.1100	.....	
29,000	58,000	.1180	.....	
30,000	60,000	.13	.....	
31,000	62,000	.14	.....	
32,000	64,000	.16	.....	
33,000	66,000	.17	.....	
34,000	68,000	.19	.....	
35,000	70,000	.21	.....	
36,000	72,000	.24	.....	
37,000	74,000	.27	.....	
38,000	76,000	.32	.....	
39,000	78,000	.39	.....	
39,980	79,960	.59	.....	
40,400	80,800	.64	.....	Tensile strength.
37,400	105,950	.....	.....	Load at time of rupture.
0	0	.78	.....	=15.6 per cent.

Fractured 1″.18 from neck. Appearance, silky. Oblique 50° with axis. No change in color.

Surface of stem varies in color from straw to purple, the purple predominating near the fracture.

Local contraction reaches 1″ each side of the place of rupture.

Diameter at fracture, ″.67. Area, .353 square inch. Contraction, 29.4 r cent.

Elongation of inch sections: ″.09, ″.11, ″.12, ″.26*, ″.20*,

No. 1749.

Marks, 2–123.
Diameter, ″.789.
Sectional area, .50 square inch.
Expansion, ″.0238 in 6 inches.
Estimated temperature, 668° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
5,000	10,000	.0010	.....	
6,000	12,000	.0013	.....	
7,000	14,000	.0016	.....	
8,000	16,000	.0020	.....	
8,500	17,000	.0021	.....	
9,000	18,000	.0024	.....	
9,500	19,000	.0027	.....	
10,000	20,000	.0032	.....	
10,500	21,000	.0039	.....	
11,000	22,000	.0045	.....	Elastic limit.
11,500	23,000	.0062	.....	
12,000	24,000	.0099	.....	
12,500	25,000	.0133	.....	
13,000	26,000	.0160	.....	
13,500	27,000	.0175	.....	
14,000	28,000	.0201	.....	
14,500	29,000	.0251	.....	
15,000	30,000	.0276	.....	
15,500	31,000	.0298	.....	
16,000	32,000	.0352	.....	
17,000	34,000	.0441	.....	
18,000	36,000	.0514	.....	
19,000	38,000	.0594	.....	
20,000	40,000	.0670	.....	
21,000	42,000	.08	.....	
22,000	44,000	.095	.....	
23,000	46,000	.11	.....	
24,000	48,000	.12	.....	
25,000	50,000	.13	.....	
26,000	52,000	.15	.....	
27,000	54,000	.15	.....	
28,000	56,000	.17	.....	
29,000	58,000	.18	.....	
30,000	60,000	.20	.....	
31,000	62,000	.21	.....	
32,000	64,000	.23	.....	
33,000	66,000	.24	.....	
34,000	68,000	.27	.....	
35,000	70,000	.29	.....	
36,000	72,000	.34	.....	
37,000	74,000	.39	.....	
38,000	76,000	.47	.....	
39,000	78,000	.57	.....	
39,600	79,200	.75	.....	Tensile strength.
35,100	112,500	.....	.....	Load at time of rupture.
0	0	.99	.....	=19.8 per cent.

Fractured 1″ from neck. Appearance, silky; oblique 48°; purple color.

Surface of stem, dark blue.

Diameter at fracture, ″.63. Area, .312 square inch. Contraction, 37.6 per cent.

Elongation of inch sections: ″.13, ″.14, ″.15, ″.20, ″.37*.

No. 1864.

Marks, 2–123.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0265 in 6 inches.
Estimated temperature, 736° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
5,000	10,000	.0019	.....	
6,000	12,000	.0023	.....	
7,000	14,000	.0028	.....	
8,000	16,000	.0033	.....	
9,000	18,000	.0039	.....	
10,000	20,000	.0050	.....	Elastic limit.
11,000	22,000	.0057	.....	
12,000	24,000	.0121	.....	
13,000	26,000	.0166	.....	
14,000	28,000	.0229	.....	
15,000	30,000	.0289	.....	
16,000	32,000	.0365	.....	
17,000	34,000	.0444	.....	
18,000	36,000	.0529	.....	
19,000	38,000	.0601	.....	
20,000	40,000	.0698	.....	
22,000	44,000	.0909	.....	
24,000	48,000	.1132	.....	
26,000	52,000	.1352	.....	
28,000	56,000	.1651	.....	
30,000	60,000	.2076	.....	
32,000	64,000	.2721	.....	
33,000	66,000	.32	.....	
34,000	68,000	.385	.....	
35,000	70,000	.54	.....	
35,060	70,120	.61	.....	Tensile strength.
25,900	108,820	.....	.....	At time of fracture.
0	0	1.24	.....	= 24.8 per cent.

Fractured 3″ from neck. Appearance, silky; dark-blue color. Surface of stem, dark blue.

Local contraction, 1″ each side of fracture.

Diameter at fracture, ″.55. Area, .238 square inch. Contraction, 52.4 per cent.

Elongation of inch sections, ″.11, ″.21, ″.60*, ″.21, ″.11.

No. 1751.

Marks, 2–123.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0282 in 6 inches.
Estimated temperature, 779° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
2,000	4,000	.0006	.....	
3,000	6,000	.0015	.....	
4,000	8,000	.0018	.....	
5,000	10,000	.0024	.....	
6,000	12,000	.0031	.....	
7,000	14,000	.0039	.....	
8,000	16,000	.0047	.....	Elastic limit.
8,500	17,000	.0056	.....	
9,000	18,000	.0064	.....	
9,500	19,000	.0080	.....	
10,000	20,000	.0099	.....	
10,500	21,000	.0123	.....	
11,000	22,000	.0142	.....	
11,500	23,000	.0164	.....	
12,000	24,000	.0195	.....	
13,000	26,000	.0268	.....	
14,000	28,000	.0333	.....	
15,000	30,000	.0427	.....	
16,000	32,000	.0514	.....	
17,000	34,000	.0633	.....	
18,000	36,000	.0731	.....	
19,000	38,000	.10	.....	
20,000	40,000	.11	.....	
21,000	42,000	.13	.....	
22,000	44,000	.15	.....	
23,000	46,000	.165	.....	
24,000	48,000	.19	.....	
25,000	50,000	.20	.....	
26,000	52,000	.23	.....	
27,000	54,000	.26	.....	
28,000	56,000	.31	.....	
29,000	58,000	.37	.....	
30,000	60,000	.47	.....	
30,500	61,200	.71	.....	Tensile strength.
21,000	99,060	.....	.....	At time of rupture.
0	0	1.01	.....	= 20.2 per cent.

Fractured ″.90 from neck. Appearance, silky; dark-blue color.
Surface of stem, dark blue. Local contraction reaches to the neck and 1¼″ from fracture in the opposite end.
Diameter at fracture, ″.52. Area, .212 square inch. Contraction 57.6 per cent.
Elongation of inch sections, ″.09, ″.10, ″.10, ″.14, ″.58*.

No. 1752.

Marks. 2–123.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0318 in 6 inches.
Estimated temperature, 869° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
2,000	4,000	.0002	.....	
3,000	6,000	.0004	.....	
4,000	8,000	.0006	.....	
5,000	10,000	.0009	.....	
6,000	12,000	.0015	.....	
6,500	13,000	.0017	.....	
7,000	14,000	.0021	.....	
7,500	15,000	.0023	.....	
8,000	16,000	.0027	.....	Elastic limit.
8,500	17,000	.0034	.....	
9,000	18,000	.0041	.....	
9,500	19,000	.0050	.....	
10,000	20,000	.0064	.....	
10,500	21,000	.0083	.....	
11,000	22,000	.0097	.....	
11,500	23,000	.0126	.....	
12,000	24,000	.0147	.....	
12,500	25,000	.0177	.....	
13,000	26,000	.0211	.....	
13,500	27,000	.0243	.....	
14,000	28,000	.0280	.....	
14,500	29,000	.0331	.....	
15,000	30,000	.0375	.....	
16,000	32,000	.0473	.....	
17,000	34,000	.0585	.....	
18,000	36,000	.0698	.....	
19,000	38,000	.0798	.....	
20,000	40,000	.0934	.....	
21,000	42,000	.1072	.....	
22,000	44,000	.1279	.....	
23,000	46,000	.1430	.....	
24,000	48,000	.175	.....	
25,000	50,000	.19	.....	
26,000	52,000	.225	.....	
27,000	54,000	.26	.....	
28,000	56,000	.315	.....	
29,000	58,000	.42	.....	
29,800	59,600	.635	.....	Tensile strength.
21,000	95,020	.....	.....	At time of rupture.
0	0	.91	.....	=18.2 per cent.

Fractured, ″.75 from neck. Appearance, silky; dark-blue color.
Surface of stem, dark blue, tinged with red.
Local contraction to neck and ″.90 in opposite end.
Diameter at fracture, ″.53. Area, .221 square inch. Contraction, 55.8 per cent.
Elongation of inch sections, ″.10, ″.10, ″.09, ″.11, ″.51*.

No. 1865.

Marks, 2–123.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0354 in 6 inches.
Estimated temperature, 959° Fahr.
Gauged length, 5′.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
5,000	10,000	.0009	.....	
8,000	16,000	.0024	.....	
9,000	18,000	.0037	.....	
10,000	20,000	.0059	.....	
10,600	21,200	.....	.....	Elastic limit.
11,000	22,000	.0101	.....	
12,000	24,000	.0150	.....	
13,000	26,000	.0205	.....	
14,000	28,000	.0280	.....	
15,000	30,000	.0367	.....	
16,000	32,000	.0461	.....	
17,000	34,000	.0585	.....	
18,000	36,000	.0740	.....	
19,000	38,000	.0924	.....	
20,000	40,000	.1166	.....	
21,060	42,000	.1382	.....	
22,000	44,000	.1792	.....	
23,000	46,000	.2200	.....	
24,000	48,000	.2875	.....	
24,500	49,000	.3752	.....	
25,000	50,000	.65	.....	Tensile strength.
12,400	31,580	.....	.....	At time of fracture.
0	0	1.73	.....	= 34.4 per cent.

Fractured 2″.90 from neck. Appearance, silky; dark-blue color. Surface of stem, dark blue with brownish cast.

Local contraction, 1″ each side of fracture.

Diameter at fracture, ″.44. Area, .152 square inch. Contraction 69.6 per cent.

Elongation of inch sections, ″.11, ″.20, ″.53*, ″.69*, ″.19.

No. 1866.

Marks, 2–123.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0390 in 6 inches.
Estimated temperature, 1050° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
5,000	10,000	.0085	.....	
7,000	14,000	.0058	.....	
7,500	15,000	.0065	.....	
8,000	16,000	.0077	.....	
8,500	17,000	.0087	.....	Elastic limit.
9,000	18,000	.0103	.....	
9,500	19,000	.0119	.....	
10,000	20,000	.0154	.....	
11,000	22,000	.0191	.....	
12,000	24,000	.0233	.....	
13,000	26,000	.0337	.....	
14,000	28,000	.0499	.....	
15,000	30,000	.0650	.....	
16,000	32,000	.0839	.....	
17,000	34,000	.1143	.....	
18,000	36,000	.1481	.....	
19,000	38,000	.2065	.....	
19,500	39,000	.2879	.....	
19,780	39,560	.38	.....	Tensile strength.
0	0	1.07	.....	= 21.4 per cent.

Fractured ″.70 from neck. Appearance, silky; blue black color. Surface of stem, dark blue.

Local contraction reaches to the neck, and 1″ from fracture.

Diameter at fracture, ″.42. Area, .139 square inch. Contraction, 72.2 per cent.

Elongation of inch sections, ″.09, ″.07, ″.08, ″.13, ″.70*.

No. 1743.

Marks, 2–123.
Diameter, ″.798.
Sectional area, 50 square inch.
Expansion, ″.0440 in 6 inches.
Estimated temperature, 1176° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
2,000	4,000	.0015	.....	
3,000	6,000	.0027	.....	
4,000	8,000	.0037	.....	
5,000	10,000	.0050	.....	(Elastic limit.)
6,000	12,000	.0069	.....	
6,500	13,000	.0093	.....	
7,000	14,000	.0134	.....	
7,500	15,000	.0182	.....	
8,000	16,000	.0241	.....	
8,500	17,000	.0327	.....	
9,000	18,000	.0423	.....	
9,500	19,000	.0631	.....	
10,000	20,000	.0935	.....	
11,000	22,000	.14	.....	
12,000	24,000	.23	.....	
13,000	26,000	.35	.....	
13,500	27,000	.58	.....	
13,560	27,120	.68	.....	Tensile strength.
0	0	1.37	.....	= 27.4 per cent.

Fractured 2″.65 from neck. Appearance, silky. Surfaces of stem and fracture dark blue. Raised a scale.

Local contraction reaches 1.″5 and 2″ from place of fracture. Center punch mark in the surface of the stem ″.12 from place of fracture, extended in major diameter from ″.02 to ″.12.

Diameter at fracture, ″.35. Area, .096 square inch. Contraction, 80.8 per cent.

Elongation of inch sections, ″.07, ″.58*, ″.62*, ″.08, ″.02.

No. 1750.

Marks, 2–123.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0528 in 6 inches.
Estimated temperature, 1397° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
2,000	4,000	.0018	.....	
3,000	6,000	.0043	.....	No appreciable elastic limit.
4,000	8,000	.0063	.....	
5,000	10,000	.0086	.....	
6,000	12,000	.0128	.....	
7,000	14,000	.0215	.....	
7,500	15,000	.0334	.....	
8,000	16,000	.0502	.....	
8,500	17,000	.0798	.....	
9,000	18,000	.14	.....	
9,500	19,000	.25	.....	
10,000	20,000	.41	.....	
10,500	21,000	.65	.....	
10,600	21,200	.89	.....	Tensile strength.
0	0	1.60	.....	=32.0 per cent.

Fractured, 2″.75 from neck. Appearance, silky; blue-black color. Surface of stem, blue black with streaks of red. Raised a scale.

Fractured surfaces each concave. Local contraction reaches 1″.9 each side of fracture.

Diameter at fracture, ″.30. Area, .071 square inch. Contraction, 85.8 per cent.

Elongation of inch sections, ″.07, ″.51*, ″.84*, ″.14, ″.04.

No. 1867.

Marks, 2–123.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0598 in 6 inches.
Estimated temperature, 1572° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
1,500	3,000	.0009	.....	
2,000	4,000	.0016	.....	
2,500	5,000	.0033	.....	Elastic limit.
3,000	6,000	.0081	.....	
3,500	7,000	.0242	.....	
4,000	8,000	.0457	.....	
4,500	9,000	.1092	.....	
5,000	10,000	.2372	.....	Tensile strength.
		.265	.....	
0	0	1.71	.....	= 34.2 per cent.

Fractured 3″.25 from neck. Appearance, silky; dark-blue color. Fractured surfaces each concave and porous. Surface of stem, dark blue. Raised a scale which was dark blue in part, and in parts vermillion and brownish-red color.

Local contraction, 1″.8 each side of fracture.

Diameter at fracture, ″.14. Area, .015 square inch. Contraction, 97.0 per cent.

Elongation of inch sections, ″.03, ″.18, 1″.28*, ″.15, ″.07.

No. 1868.

Marks, 2–123.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0601 in 6 inches.
Estimated temperature, 1580° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
1,500	3,000	.0016	.....	
2,000	4,000	.0033	.....	
2,500	5,000	.0063	.....	
3,000	6,000	.0119	.....	
3,500	7,000	.0246	.....	
4,000	8,000	.0544	.....	
4,500	9,000	.1101	.....	
4,960	9,920	.2631	.....	Tensile strength.
4,650	.....	.505	.....	Test discontinued; bar was stretching at this time and load slowly falling.

Load released and bar allowed to cool to about 90° Fahr., resting in the meantime 1½ hours.
Measurements after cooling to 90°.
Total elongation, ″.50 = 10.0 per cent.
Elongation of inch sections, ″.02, ″.09, ″.19, ″.13, ″.07.
Minimum diameter, ″.728. Area, .416 square inch. Contraction, 16.8 per cent.
Loads again applied and present strength determined.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
18,200	.....	.....	.....	Elastic limit.
	36,400	.....	.....	On original area.
	43,680	.....	.....	On reduced area.
26,880	.....	.....	.....	Tensile strength.
	53,720	.....	.....	On original area.
	64,570	.....	.....	On reduced area.
24,000	104,800	.....	.....	At time of fracture.
0	0	1.28	.....	=25.6 per cent. From original length.

Fractured at middle of stem. Appearance, silky.
Local contraction, 1″.3 and 1″.6 from fracture.
Diameter at fracture, ″.54. Area, .229 square inch. Contraction, .2 per cent.
Elongation of inch sections, ″.07, ″.18, ″.65*, ″.25, ″.13.

No. 1772.

Marks, 3–782.
Diameter, ″.792.
Sectional area, .4926 square inch.
Temperature, 0° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	2,030	0.	0.	Initial load.
2,000	4,060	.0007	.....	
10,000	20,300	.0029	.....	
15,000	30,450	.0045	.....	
20,000	40,600	.0063	.....	
21,000	42,630	.0067	.....	
22,000	44,660	.0072	.....	
23,000	46,690	.0068	.....	
23,500	47,705	.0066	.....	
24,000	48,720	.0063	.....	Elastic limit.
Load fell.				
22,000	44,660	.0223	.....	
23,000	46,690	.0344	.....	
24,000	48,720	.0665	.....	
25,000	50,750	.0750	.....	
26,000	52,780	.0866	.....	
27,000	54,810	.0958	.....	
28,000	56,840	.1071	.....	
29,000	58,870	.1179	.....	
30,000	60,900	.1313	.....	
31,000	62,930	.1460	.....	
32,000	64,960	.1620	.....	
33,000	66,990	.18	.....	
34,000	69,020	.195	.....	
35,000	71,050	.22	.....	
36,000	73,080	.24	.....	
37,000	75,110	.28	.....	
38,000	77,140	.315	.....	
39,000	79,170	.35	.....	
40,000	81,200	.40	.....	
41,000	83,230	.48	.....	
42,000	85,260	.66	.....	
42,180	85,630	.78	.....	Tensile strength.
37,000	114,910	.....	.....	At time of rupture.
0	0	1.12	.....	= 22.4 per cent.

Fractured 2″.50 from neck at center punch mark. Appearance, granular, radiating from center punch mark in circumference.

Minimum diameter ¼″ from place of rupture, ″.61. Local contraction, ″.9 each side of this point.

Diameter at fracture, ″.64. Area, .322 square inch. Contraction, 35.6 per cent.

Elongation of inch sections, ″.12, ″.17, ″.44*, ″.25, ″.14.

No. 1809.

Marks, 3–782.
Diameter, ″.798.
Sectional area, .50 square inch.
Temperature, 70° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
5,000	10,000	.0014	.....	
10,000	20,000	.0030	.....	
15,000	30,000	.0049	.....	
20,000	40,000	.0065	.....	
21,000	42,000	.0068	.....	
22,000	44,000	.0073	.....	
23,000	46,000	.0077	.....	Elastic limit.
Load fell.				
21,000	42,000	.0450	.....	
22,000	44,000	.0552	.....	
23,000	46,000	.0630	.....	
24,000	48,000	.0728	.....	
25,000	50,000	.0833	.....	
26,000	52,000	.0981	.....	
27,000	54,000	.1065	.....	
28,000	56,000	.1188	.....	
29,000	58,000	.1335	.....	
30,000	60,000	.1464	.....	
31,000	62,000	.165	.....	
32,000	64,000	.18	.....	
33,000	66,000	.20	.....	
34,000	68,000	.23	.....	
35,000	70,000	.255	.....	
36,000	72,000	.28	.....	
37,000	74,000	.33	.....	
38,000	76,000	.38	.....	
39,000	78,000	.45	.....	
40,000	80,000	.55	.....	
40,990	81,980	.....	.....	Tensile strength.
35,300	129,200	.....	.....	At time of fracture.
0	0	1.25	.....	= 25.0 per cent.

Fractured 2″.50 from neck. Appearance, silky, slightly granular; radiating from center-punch mark in circumference.

Diameter at fracture, ″.59. Area, .273 square inch. Contraction, 45.4 per cent.

Elongation of inch sections, ″.15, ″.20, ″.38*, ″.36*, ″.16.

No. 1755.

Marks, 3–782.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0060 in 6 inches.
Estimated temperature, 223° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
2,000	4,000	.0004	.....	
10,000	20,000	.0026	.....	
11,000	22,000	.0035	.....	
12,000	24,000	.0039	.....	
13,000	26,000	.0041	.....	
14,000	28,000	.0045	.....	
15,000	30,000	.0047	.....	
16,000	32,000	.0051	.....	
17,000	34,000	.0056	.....	
18,000	36,000	.0060	.....	
19,000	38,000	.0061	.....	
20,000	40,000	.0064	.....	
21,000	42,000	.0066	.....	Elastic limit.
Load fell.				
20,000	40,000	.0432	.....	
21,000	42,000	.0549	.....	
22,000	44,000	.0584	.....	
24,000	48,000	.0692	.....	
25,000	50,000	.0838	.....	
26,000	52,000	.0852	.....	
27,000	54,000	.1081	.....	
28,000	56,000	.1066	.....	
29,000	58,000	.1075	.....	
30,000	60,000	.1442	.....	
31,000	62,000	.16	.....	
32,000	64,000	.16	.....	
33,000	66,000	.185	.....	
34,000	68,000	.24	.....	
35,000	70,000	.245	.....	
36,000	72,000	.245	.....	
37,000	74,000	.365	.....	
39,000	78,000	.365	.....	
39,400	78,800	.67	.....	Tensile strength.
34,000	128,790	.....	.....	At time of rupture.
0	0	1.00	.....	= 20.0 per cent.

Fractured 1″.05 from neck. Appearance, silky.
Local contraction, 1″ each side of fracture.
Diameter at fracture, ″.58. Area, .264 square inch. Contraction, 47.2 per cent.
Elongation of inch sections, ″.39*, ″.20, ″.15, ″.14, ″.12.

No. 1754.

Marks, 3–782.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0105 in 6 inches.
Estimated temperature, 339° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
5,000	10,000	.0013	.....	
10,000	20,000	.0029	.....	
15,000	30,000	.0048	.....	
16,000	32,000	.0051	.....	
17,000	34,000	.0053	.....	
18,000	36,000	.0054	.....	
19,000	38,000	.0056	.....	
20,000	40,000	.0057	.....	
21,000	42,000	.0059	.....	Elastic limit.
21,500	43,000	.0093	.....	
22,000	44,000	.0530	.....	
25,000	50,000	.0541	.....	Throbs.
26,000	52,000	.0698	.....	
27,000	54,000	.0748	.....	
28,000	56,000	.0775	.....	
29,000	58,000	.0827	.....	
30,000	60,000	.0840	.....	
31,000	62,000	.1030	.....	
32,000	64,000	.1243	.....	
33,000	66,000	.1284	.....	
34,000	68,000	.1374	.....	
35,000	70,000	.1415	.....	
36,000	72,000	.145	.....	
37,000	74,000	.285	.....	
38,000	76,000	.24	.....	
39,000	78,000	.24	.....	
40,000	80,000	.24	.....	
41,000	82,000	.235	.....	
41,800	83,600	.515	.....	
42,000	84,000	.645	.....	
44,000	88,000	.655	.....	
44,800	89,600	.....	.....	Tensile strength.
42,280	122,390	.....	.....	At time of rupture.
0	0	.70	.....	= 14.0 per cent.

Fractured 2″.10 from neck. Appearance, silky.
Local contraction, ″.90 each side of fracture.
Diameter at fracture, ″.66. Area, .342 square inch. Contraction, 31.6 per cent.
Elongation of inch sections, ″.08, ″.26*, ″.17, ″.08, ″.11.

No. 1753.

Marks, 3–782.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0141 in 6 inches.
Estimated temperature, 431° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
5,000	10,000	.0004	.....	
10,000	20,000	.0016	.....	
15,000	30,000	.0028	.....	
16,000	32,000	.0030	.....	
17,000	34,000	.0035	.....	
18,000	36,000	.0039	.....	
19,000	38,000	.0043	.....	
20,000	40,000	.0044	.....	Elastic limit.
20,500	41,000	.0102	.....	
21,000	42,000	.0379	.....	
22,000	44,000	.0406	.....	
24,000	48,000	.0451	.....	
25,000	50,000	.0514	.....	
26,000	52,000	.0572	.....	
27,000	54,000	.0634	.....	
28,000	56,000	.0698	.....	
29,000	58,000	.0768	.....	
30,000	60,000	.0825	.....	
31,000	62,000	.0909	.....	
32,000	64,000	.0989	.....	
33,000	66,000	.1090	.....	
34,000	68,000	.1170	.....	
35,000	70,000	.1236	.....	
36,000	72,000	.1345	.....	
37,000	74,000	.1460	.....	
38,000	76,000	.1576	.....	
39,000	78,000	.1711	.....	
40,000	80,000	.23	.....	
41,000	82,000	.24	.....	
42,000	84,000	.245	.....	
43,000	86,000	.25	.....	
44,000	88,000	.32	.....	
45,000	90,000	.325	.....	
45,800	91,500	.52	.....	Tensile strength.
42,400	123,980	.....	.....	At time of rupture.
0	0	.76	.....	=15.2 per cent.

Fractured 1″.25 from neck. Appearance, silky; no change in color.
Surface of stem, straw colored.
Local contraction, ″.80 each side of fracture.
Diameter at fracture, ″.66. Area, .342 square inch. Contraction, 31.6 per cent.
Elongation of inch sections, ″.09, ″.10, ″.11, ″.22*, ″.24*.

No. 1756.

Marks, 3–782.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0195 in 6 inches.
Estimated temperature, 569° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
2,000	4,000	.0004	.....	
10,000	20,000	.0038	.....	
11,000	22,000	.0043	.....	
12,000	24,000	.0050	.....	
14,000	28,000	.0062	.....	
15,000	30,000	.0066	.....	
16,000	32,000	.0072	.....	
16,500	33,000	.0078	.....	Elastic limit.
17,000	34,000	.0096	.....	
17,500	35,000	.0200	.....	
18,000	36,000	.0228	.....	
18,500	37,000	.0257	.....	
19,000	38,000	.0274	.....	
20,000	40,000	.0337	.....	
21,000	42,000	.0406	.....	
22,000	44,000	.0471	.....	
23,000	46,000	.0537	.....	
24,000	48,000	.0596	.....	
25,000	50,000	.0696	.....	
26,000	52,000	.0764	.....	
27,000	54,000	.0838	.....	
28,000	56,000	.0908	.....	
29,000	58,000	.0980	.....	
30,000	60,000	.1097	.....	
31,000	62,000	.12	.....	
32,000	64,000	.125	.....	
33,000	66,000	.145	.....	
34,000	68,000	.155	.....	
35,000	70,000	.17	.....	
36,000	72,000	.18	.....	
37,000	74,000	.19	.....	
38,000	76,000	.20	.....	
39,000	78,000	.22	.....	
40,000	80,000	.23	.....	
41,000	82,000	.25	.....	
42,000	84,000	.28	.....	
43,000	86,000	.31	.....	
44,000	88,000	.34	.....	
45,000	90,000	.39	.....	
46,000	92,000	.45	.....	
47,000	94,000	.54	.....	
47,700	95,400	.81	.....	Tensile strength.
38,500	136,040	.....	.....	At time of rupture.
0	0	1.22	.....	=24.4 per cent.

Fractured 1″.70 from neck. Appearance, silky; blue color. Surface of stem same color.

Local contraction, ″.9 each side of fracture.

Diameter at fracture, ″.60. Area, .283 square inch. Contraction, 43.4 per cent.

Elongation of inch sections, ″.22, ″.47*, ″.22, ″.18, ″.13.

No. 1869.

Marks, 3–782.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0227 in 6 inches.
Estimated temperature, 651° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
5,000	10,000	.0019	.....	
10,000	20,000	.0037	.....	
11,000	22,000	.0043	.....	
12,000	24,000	.0049	.....	
13,000	26,000	.0054	.....	Elastic limit.
14,000	28,000	.0067	.....	
14,500	29,000	.0091	.....	
15,000	30,000	.0109	.....	
15,500	31,000	.0126	.....	
16,000	32,000	.0143	.....	
17,000	34,000	.0193	.....	
18,000	36,000	.0220	.....	
19,000	38,000	.0291	.....	
20,000	40,000	.0353	.....	
22,000	44,000	.0489	.....	
24,000	48,000	.0619	.....	
26,000	52,000	.0776	.....	
28,000	56,000	.0939	.....	
30,000	60,000	.1124	.....	
32,000	64,000	.1340	.....	
34,000	68,000	.1621	.....	
36,000	72,000	.1941	.....	
38,000	76,000	.2334	.....	
39,000	78,000	.27	.....	
40,000	80,000	.295	.....	
41,000	82,000	.325	.....	
42,000	84,000	.38	.....	
43,000	86,000	.46	.....	
43,600	87,200	.61	.....	Tensile strength.
30,200	136,650	.....	.....	At time of fracture.
0	0	1.21	.....	=24.2 per cent.

Fractured 2″ from neck. Appearance, silky; dark-blue color. Surface of stem, blue black.

Local contraction, ″.9 and 1″.1 from fracture.

Diameter at fracture, ″.53. Area, .221 square inch. Contraction, 55.8 per cent.

Elongation of inch sections, ″.19, ″.60*, ″.20, ″.13, ″.09.

No. 1759.

Marks, 3–782.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0261 in 6 inches.
Estimated temperature, 738° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
2,000	4,000	.0008	.....	
10,000	20,000	.0042	.....	
10,500	21,000	.0045	.....	
11,000	22,000	.0051	.....	
11,500	23,000	.0054	.....	
12,000	24,000	.0062	.....	
12,500	25,000	.0066	.....	
13,000	26,000	.0069	.....	Elastic limit.
13,500	27,000	.0086	.....	
14,000	28,000	.0107	.....	
14,500	29,000	.0130	.....	
15,000	30,000	.0144	.....	
15,500	31,000	.0159	.....	
16,000	32,000	.0179	.....	
16,500	33,000	.0202	.....	
17,000	34,000	.0223	.....	
18,000	36,000	.0285	.....	
19,000	38,000	.0349	.....	
20,000	40,000	.0412	.....	
21,000	42,000	.0476	.....	
22,000	44,000	.0556	.....	
23,000	46,000	.0610	.....	
24,000	48,000	.0688	.....	
25,000	50,000	.0796	.....	
26,000	52,000	.0874	.....	
27,000	54,000	.0956	.....	
28,000	56,000	.1040	.....	
29,000	58,000	.1145	.....	
30,000	60,000	.1257	.....	
31,000	62,000	.14	.....	
32,000	64,000	.15	.....	
33,000	66,000	.17	.....	
34,000	68,000	.185	.....	
35,000	70,000	.205	.....	
36,000	72,000	.22	.....	
37,000	74,000	.25	.....	
38,000	76,000	.285	.....	
39,000	78,000	.31	.....	
40,000	80,000	.34	.....	
41,000	82,000	.43	.....	
42,000	84,000	.57	.....	
42,250	84,500	.69	.....	Tensile strength.
30,600	133,620	.....	.....	At time of rupture.
0	0	1.18	.....	=23.6 per cent.

Fractured 1″.10 from neck. Appearance, silky; cup-shaped ends. Fracture and surface of stem blue color.

Local contraction, 1″ each side of fracture.

Diameter at fracture, ″.54. Area, .229 square inch. Contraction, 4.2 per cent.

Elongation of inch sections, ″.18, ″.16, ″.15, ″.18, ″.51*.

No. 1757.

Marks, 3–782.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0298 in 6 inches.
Estimated temperature, 832° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
2,000	4,000	.0007	.....	
3,000	6,000	.0012	.....	
4,000	8,000	.0015	.....	
5,000	10,000	.0019	.....	
6,000	12,000	.0025	.....	
7,000	14,000	.0029	.....	
8,000	16,000	.0032	.....	
9,000	18,000	.0036	.....	
10,000	20,000	.0039	.....	
11,000	22,000	.0046	.....	
12,000	24,000	.0051	.....	Elastic limit.
12,500	25,000	.0066	.....	
13,000	26,000	.0079	.....	
13,500	27,000	.0092	.....	
14,000	28,000	.0101	.....	
14,500	29,000	.0116	.....	
15,000	30,000	.0127	.....	
15,500	31,000	.0144	.....	
16,000	32,000	.0165	.....	
16,500	33,000	.0188	.....	
17,000	34,000	.0220	.....	
18,000	36,000	.0299	.....	
19,000	38,000	.0340	.....	
20,000	40,000	.0423	.....	
21,000	42,000	.0495	.....	
22,000	44,000	.0565	.....	
23,000	46,000	.0649	.....	
24,000	48,000	.0735	.....	
25,000	50,000	.0815	.....	
26,000	52,000	.0913	.....	
27,000	54,000	.0985	.....	
28,000	56,000	.1114	.....	
29,000	58,000	.12	.....	
30,000	60,000	.13	.....	
31,000	62,000	.14	.....	
32,000	64,000	.16	.....	
33,000	66,000	.17	.....	
34,000	68,000	.195	.....	
35,000	70,000	.215	.....	
36,000	72,000	.23	.....	
37,000	74,000	.27	.....	
38,000	76,000	.285	.....	
39,000	78,000	.34	.....	
40,000	80,000	.39	.....	
41,000	82,000	.47	.....	
41,800	83,600	.71	.....	Tensile strength.
30,000	131,000	.....	.....	At time of rupture.
0	0	1.21	.....	= 24.2 per cent.

Fractured 1″.10 from neck. Appearance, silky; blue-black color Surface of stem same color.

Local contraction, 1″ each side of fracture.

Diameter at fracture, ″.54. Area, .229 square inch. Contraction 54.2 per cent.

Elongation of inch sections, ″.14, ″.16, ″.16, ″.23, ″.52*.

No. 1758.

Marks, 3–782.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0348 in 6 inches.
Estimated temperature, 960° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
2,000	4,000	.0010	.....	
3,000	6,000	.0014	.....	
4,000	8,000	.0015	.....	
5,000	10,000	.0017	.....	
6,000	12,000	.0023	.....	
7,000	14,000	.0029	.....	
7,500	15,000	.0030	.....	
8,000	16,000	.0035	.....	
9,000	18,000	.0039	.....	
9,500	19,000	.0042	.....	Elastic limit.
10,000	20,000	.0047	.....	
10,500	21,000	.0051	.....	
11,000	22,000	.0058	.....	
11,500	23,000	.0067	.....	
12,000	24,000	.0075	.....	
12,500	25,000	.0085	.....	
13,000	26,000	.0094	.....	
13,500	27,000	.0107	.....	
14,000	28,000	.0118	.....	
14,500	29,000	.0137	.....	
15,000	30,000	.0154	.....	
15,500	31,000	.0177	.....	
16,000	32,000	.0199	.....	
17,000	34,000	.0259	.....	
18,000	36,000	.0328	.....	
19,000	38,000	.0392	.....	
20,000	40,000	.0470	.....	
21,000	42,000	.0554	.....	
22,000	44,000	.0654	.....	
23,000	46,000	.0730	.....	
24,000	48,000	.0829	.....	
25,000	50,000	.0939	.....	
26,000	52,000	.11	.....	
27,000	54,000	.12	.....	
28,000	56,000	.135	.....	
29,000	58,000	.15	.....	
30,000	60,000	.16	.....	
31,000	62,000	.19	.....	
32,000	64,000	.22	.....	
33,000	66,000	.27	.....	
34,000	68,000	.325	.....	
35,000	70,000	.415	.....	
35,100	70,200	.45	.....	Tensile strength.
22,000	106,600	.....	.....	At time of rupture.
0	0	.78	.....	=15.6 per cent.

Fractured ″.70 from neck. Appearance, silky. Cup-shaped ends; dark-blue color. Surface of stem, blue black.

Local contraction reaches to the neck, and 1″ from fracture.

Diameter at fracture, ″.52. Area, .212 square inch. Contraction, 57.6 per cent.

Elongation of inch sections, ″.08, ″.07, ″.07, ″.08, ″.48*.

No. 1871.

Marks, 3–782.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0372 in 6 inches.
Estimated temperature, 1021° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
5,000	10,000	.0028	.....	
6,000	12,000	.0040	.....	
7,000	14,000	.0049	.....	
8,000	16,000	.0052	.....	
9,000	18,000	.0061	.....	
10,000	20,000	.0068	.....	Elastic limit.
11,000	22,000	.0082	.....	
12,000	24,000	.0100	.....	
13,000	26,000	.0127	.....	
14,000	28,000	.0164	.....	
15,000	30,000	.0207	.....	
16,000	32,000	.0275	.....	
17,000	34,000	.0355	.....	
18,000	36,000	.0441	.....	
19,000	38,000	.0548	.....	
20,000	40,000	.0661	.....	
21,000	42,000	.0805	.....	
22,000	44,000	.1002	.....	
23,000	46,000	.1179	.....	
24,000	48,000	.1370	.....	
25,000	50,000	.1655	.....	
26,000	52,000	.2148	.....	
27,000	54,000	.2765	.....	
28,000	56,000	.43	.....	
28,060	56,120	.52	.....	Tensile strength.
15,800	87,290	.....	.....	At time of fracture.
0	0	1.34	.....	= 26.8 per cent.

Fractured 1″ from neck. Appearance, silky; dark blue. Surface of stem, dark blue with brownish cast.

Local contraction, 1″ each side of fracture.

Diameter at fracture, ″.48. Area, .181 square inch. Contraction, 63.8 per cent.

Elongation of inch sections, ″.13, ″.15, ″.17, ″.23, ″.66*.

No. 1760.

Marks, 3–782.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0405 in 6 inches.
Estimated temperature, 1106° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
2,000	4,000	.0011	.....	
3,000	6,000	.0017	.....	
4,000	8,000	.0018	.....	
5,000	10,000	.0022	.....	
6,000	12,000	.0028	.....	
6,500	13,000	.0031	.....	
7,000	14,000	.0037	.....	
7,500	15,000	.0039	.....	
8,000	16,000	.0045	.....	
8,500	17,000	.0052	.....	
9,000	18,000	.0053	.....	Elastic limit.
9,500	19,000	.0059	.....	
10,000	20,000	.0065	.....	
10,500	21,000	.0072	.....	
11,000	22,000	.0080	.....	
11,500	23,000	.0091	.....	
12,000	24,000	.0104	.....	
12,500	25,000	.0120	.....	
13,000	26,000	.0137	.....	
13,500	27,000	.0158	.....	
14,000	28,000	.0184	.....	
15,000	30,000	.0233	.....	
16,000	32,000	.0295	.....	
17,000	34,000	.0393	.....	
18,000	36,000	.0502	.....	
19,000	38,000	.0616	.....	
20,000	40,000	.0739	.....	
21,000	42,000	.105	.....	
22,000	44,000	.125	.....	
23,000	46,000	.14	.....	
24,000	48,000	.165	.....	
25,000	50,000	.195	.....	
26,000	52,000	.245	.....	
27,000	54,000	.345	.....	
27,200	54,400	.405	.....	Tensile strength.
15,700	80,100	.....	.....	At time of rupture.
0	0	.73	.....	=14.6 per cent.

Fractured ″.70 from neck. Appearance, fine silky. Fracture and surface of stem blue-black color, in part reddish brown.

Local contraction reaches to the neck, and 1″ from fracture.

Diameter at fracture, ″.50. Area, .196 square inch. Contraction, 60.8 per cent.

Elongation of inch sections, ″.05, ″.05, ″.05, ″.07, ″.51*.

No. 1875.

Marks, 3–782.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0416 in 6 inches.
Estimated temperature, 1134° Fahr.
Gauged length, 5″.
Before commencing this test the supply of heat was regulated so that the bar was increasing in temperature very slowly.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
2,000	4,000	.0022	.....	
.....	.....	.0025	.....	After ½ minute.
3,000	6,000	.0031	.....	
.....	.....	.0033	.....	Do.
4,000	8,000	.0037	.....	
.....	.....	.0038	.....	Do.
6,000	12,000	.0040	.....	
.....	.....	.0043	.....	Do.
7,000	14,000	.0049	.....	
.....	.....	.0054	.....	Do.
8,000	16,000	.0061	.....	Elastic limit.
.....	.....	.0063	.....	After ½ minute.
9,000	18,000	.0080	.....	
.....	.....	.0090	.....	Do.
10,000	20,000	.0104	.....	
.....	.....	.0117	.....	Do.
11,000	22,000	.0138	.....	
.....	.....	.0164	.....	Do.
12,000	24,000	.0192	.....	
.....	.....	.0224	.....	Do.
13,000	26,000	.0259	.....	
.....	.....	.0313	.....	Do.
14,000	28,000	.0352	.....	
.....	.....	.0425	.....	Do.
15,000	30,000	.0486	.....	
.....	.....	.0600	.....	Do.
16,000	32,000	.0713	.....	
.....	.....	.0829	.....	Do.
.....	.....	.0909	.....	After 1 minute.
.....	.....	.0977	.....	After 1½ minutes.
.....	.....	.1034	.....	After 2 minutes.
.....	.....	.1143	.....	After 3 minutes.
.....	.....	.1256	.....	After 4 minutes.
.....	.....	.1356	.....	After 5 minutes.
.....	.....	.1451	.....	After 6 minutes.
.....	.....	.1544	.....	After 7 minutes.
.....	.....	.1641	.....	After 8 minutes.
.....	.....	.1731	.....	After 9 minutes.
.....	.....	.1824	.....	After 10 minutes.
.....	.....	.1909	.....	After 11 minutes.
.....	.....	.2004	.....	After 12 minutes.
.....	.....	.2096	.....	After 13 minutes.
.....	.....	.2176	.....	After 14 minutes.
.....	.....	.2269	.....	After 15 minutes.
.....	.....	.2359	.....	After 16 minutes.
.....	.....	.2451	.....	After 17 minutes.
.....	.....	.2544	.....	After 18 minutes.
.....	.....	.2637	.....	After 19 minutes.
.....	.....	.2731	.....	After 20 minutes.
.....	.....	.2827	.....	After 21 minutes.
.....	.....	.2919	.....	After 22 minutes.
.....	.....	.3021	.....	After 23 minutes.
.....	.....	.3119	.....	After 24 minutes.
.....	.....	.3219	.....	After 25 minutes.
.....	.....	.3319	.....	After 26 minutes.
.....	.....	.3416	.....	After 27 minutes.
.....	.....	.3519	.....	After 28 minutes.
.....	.....	.3629	.....	After 29 minutes.
.....	.....	.3736	.....	After 30 minutes.
.....	.....	.3849	.....	After 31 minutes.
.....	.....	.3959	.....	After 32 minutes.
.....	.....	.4069	.....	After 33 minutes.
.....	.....	.4186	.....	After 34 minutes.

No. 1875—Continued.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
		.4304		After 35 minutes.
		.4444		After 36 minutes.
		.4567		After 37 minutes.
		.4696		After 38 minutes.
		.4829		After 39 minutes.
		.4959		After 40 minutes.
		.5089		After 41 minutes.
		.5229		After 42 minutes.
		.5359		After 43 minutes.
		.5509		After 44 minutes.
		.5649		After 45 minutes.
		.5805		After 46 minutes.
		.5949		After 47 minutes.
		.6107		After 48 minutes.
		.6264		After 49 minutes.
		.6427		After 50 minutes.
		.6599		After 51 minutes.
		.6769		After 52 minutes.
		.6959		After 53 minutes.
		.7144		After 54 minutes.
		.7339		After 55 minutes.
		.7569		After 56 minutes.
		.77		After 57 minutes.
		.79		After 58 minutes.
		.815		After 59 minutes.
		.835		After 60 minutes.
		.865		After 61 minutes.
		.905		After 62 minutes.
		.925		After 63 minutes.
		.965		After 64 minutes.
		1.00		After 65 minutes.
		1.04		After 66 minutes.
		1.09		After 67 minutes.
		1.16		After 68 minutes.
		1.26		After 69 minutes.
		1.48		After 70 minutes.
16,000	22,000			Tensile strength.

Test discontinued, rupture not complete.

From the rapid increase in stretch, it is evident the bar would have fractured within a brief period of time if the load had been continued.

The total time which had now elapsed since the commencement of the test was 1 hour and 20 minutes, and during this time it is probable that the temperature of the bar may have increased 60 degrees, more or less, provided the rate of increase continued the same during the test it did the half hour preceding.

Bar cooled to 70° Fahr.

Total elongation, 1″.48=29.6 per cent.

Elongation of inch sections ,″.10, ″.32, ″.70, ″.25, ″.11.

Minimum diameter ″.10 from middle of stem, ″.565. Area, .251 square inch. Contraction, 49.8 per cent.

Bar now loaded to rupture.

] sile strength, 26,700 pounds=106,800 pounds per square inch on red ed area. Load at time of fracture, 24,600 pounds=135,910 pounds per nuare inch.

] l elongation, 1″.65=33.0 per cent.

] ctured ″.20 from middle of stem. Appearance, silky. The stem ta .d in diameter from each neck to the place of rupture. The most ra ' taper occurs ″.50 each side of fracture.

] neter at fracture, ″.48. Area, .181 square inch. Contraction, 63. er cent.

] tion of inch sections, ″.10, ″.32, ″.86*, ″.26, ″.11.

No. 1872.

Marks, 3–782.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0441 in 6 inches.
Estimated temperature, 1198° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
2,000	4,000	.0009	.....	
3,000	6,000	.0015	.....	
4,000	8,000	.0027	.....	
5,000	10,000	.0035	.....	
6,000	12,000	.0044	.....	Elastic limit (not well defined).
7,000	14,000	.0058	.....	
8,000	16,000	.0076	.....	
9,000	18,000	.0093	.....	
10,000	20,000	.0113	.....	
11,000	22,000	.0150	.....	
12,000	24,000	.0221	.....	
13,000	26,000	.0325	.....	
14,000	28,000	.0482	.....	
15,000	30,000	.0729	.....	
16,000	32,000	.1061	.....	
16,500	33,000	.1524	.....	
17,000	34,000	.1891	.....	
17,500	35,000	.2233	.....	
18,000	36,000	.29	.....	
18,500	37,000	.39	.....	Tensile strength.
		.79	.....	
8,300	62,880	.....	.....	At time of fracture.
0	0	1.55	.....	= 31.0 per cent.

Fractured 3″ from neck. Appearance, silky; dark-blue color. Surface of stem, blue-black.

Local contraction, 1″.6 each side of fracture.

Diameter at fracture, ″.41. Area, .132 square inch. Contraction, 73.6 per cent.

Elongation of inch sections, ″.10, ″.31, ″.87*, ″.20, ″.07.

No. 1870.

Marks, 3–782.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0445 in 6 inches.
Estimated temperature, 1208° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
2,000	4,000	.0013	.....	
3,000	6,000	.0019	.....	
4,000	8,000	.0028	.....	
5,000	10,000	.0043	.....	
6,000	12,000	.0058	.....	Elastic limit.
7,000	14,000	.0085	.....	
8,000	16,000	.0106	.....	
9,000	18,000	.0153	.....	
10,000	20,000	.0217	.....	
11,000	22,000	.0290	.....	
12,000	24,000	.0474	.....	
13,000	26,000	.0820	.....	
14,000	28,000	.1272	.....	
14,800	29,600	.2343	.....	
		.4398	.....	
15,000	30,000	.65	.....	Tensile strength.
		.86	.....	
0	0	1.14	.....	= 22.8 per cent.

Fractured 2″.75 from neck. Appearance, silky; dark-blue color. Surface of stem dark-blue.

Local contraction, 1″.5 each side of fracture.

Diameter at fracture, ″.40. Area, .126 square inch. Contraction, 74.8 per cent.

Elongation of inch sections, ″.01, ″.05, ″.29, ″.72*, ″.07.

No. 1762.

Marks, 3–782.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0486 in 6 inches.
Estimated temperature, 1313° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
2,000	4,000	.0010	.....	
3,000	6,000	.0022	.....	
4,000	8,000	.0037	.....	
4,500	9,000	.0043	.....	Elastic limit.
5,000	10,000	.0054	.....	
5,500	11,000	.0062	.....	
6,000	12,000	.0083	.....	
6,500	13,000	.0095	.....	
7,000	14,000	.0123	.....	
7,500	15,000	.0157	.....	
8,000	16,000	.0185	.....	
8,500	17,000	.0252	.....	
9,000	18,000	.0314	.....	
9,500	19,000	.0454	.....	
10,000	20,000	.0585	.....	
10,500	21,000	.0767	.....	
11,000	22,000	.1004	.....	
11,500	23,000	.1501	.....	
12,000	24,000	.28	.....	
12,200	24,400	.48	.....	Tensile strength.
.....	.....	.....	.....	Cherry red when fractured.
0	0	1.23	.....	=24.6 per cent.

Fractured 2″.50 from neck. Appearance, silky; dark-blue color. Surface of stem, same color. Raised scale in vicinity of fracture.

Local contraction, 1″.6 each side of fracture.

Diameter at fracture, ″.26. Area, .053 square inch. Contraction, 89.4 per cent.

Elongation of inch sections, ″.05, ″.93*, ″.21, ″.03, ″.01.

No. 1761.

Marks, 3–782.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0501 in 6 inches.
Estimated temperature, 1351° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
2,000	4,000	.0007	.....	
3,000	6,000	.0017	.....	
4,000	8,000	.0025	.....	Elastic limit.
4,500	9,000	.0032	.....	
5,000	10,000	.0039	.....	
5,500	11,000	.0048	.....	
6,000	12,000	.0060	.....	
6,500	13,000	.0072	.....	
7,000	14,000	.0089	.....	
7,500	15,000	.0109	.....	
8,000	16,000	.0130	.....	
8,500	17,000	.0153	.....	
9,000	18,000	.0191	.....	
9,500	19,000	.0236	.....	
10,000	20,000	.0292	.....	
10,500	21,000	.0343	.....	
11,000	22,000	.0429	.....	
11,500	23,000	.0528	.....	
12,000	24,000	.0703	.....	
13,000	26,000	.0977	.....	
14,000	28,009	.155	.....	
15,000	30,000	.285	.....	
15,850	31,700	.455	.....	Tensile strength.
0	0	1.54	.....	=30.8 per cent.

Fractured 2″.25 from neck. Appearance, silky; medium blue color. Surface of stem medium blue color with red spot at fractured end. Raised scale.

Local contraction 1″.5 each side of fracture.

Diameter at fracture, ″.35. Area, .096 square inch. Contraction, 80.8 per cent.

Elongation of inch sections, ″.06, ″.10, ″.25, ″.97*, ″.16.

No. 1876.

Marks, 3–782.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0522 in 6 inches.
Estimated temperature, 1405° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
1,500	3,000	.0010		
2,000	4,000	.0018		
2,500	5,000	.0023		
3,000	6,000	.0029		
		.0032		After ¼ minute.
3,500	7,000	.0036		Elastic limit.
		.0044		After ½ minute.
4,000	8,000	.0051		
		.0060		Do.
4,500	9,000	.0070		
		.0083		Do.
5,000	10,000	.0094		
		.0113		Do.
5,500	11,000	.0134		
		.0161		Do.
6,000	12,000	.0182		
		.0224		Do.
6,500	13,000	.0251		
		.0301		Do.
7,000	14,000	.0340		
		.0438		Do.
		.0522		After 1 minute.
		.0678		After 2 minutes.
		.0759		After 2½ minutes.
		.0840		After 3 minutes.
		.0918		After 3½ minutes.
		.0988		After 4 minutes.
		.1064		After 4½ minutes.
		.1138		After 5 minutes.
		.1214		After 5½ minutes.
		.1292		After 6 minutes.
		.1368		After 6½ minutes.
		.1453		After 7 minutes.
		.1528		After 7½ minutes.
		.1609		After 8 minutes.
		.1693		After 8½ minutes.
		.1770		After 9 minutes.
		.1859		After 9½ minutes.
		.1938		After 10 minutes.
		.2018		After 10½ minutes.
		.2108		After 11 minutes.
		.2198		After 11½ minutes.
		.2293		After 12 minutes.
		.2383		After 12½ minutes.
		.2478		After 13 minutes.
		.265		After 14 minutes.
		.29		After 15 minutes.
		.315		After 16 minutes.
		.335		After 17 minutes.
		.355		After 18 minutes.
		.385		After 19 minutes.
		.41		After 20 minutes.
		.44		After 21 minutes.
		.475		After 22 minutes.
		.515		After 23 minutes.
		.555		After 24 minutes.
		.605		After 25 minutes.
		.675		After 26 minutes.
		.765		After 27 minutes.
		.975		After 28 minutes.
7,000	14,000			Tensile strength.

Load released and test discontinued. The bar allowed to cool to 70° Fahr., and rest unloaded 15 hours.

No. 1876—Continued.

Total elongation, ″.95=19 per cent.
Elongation of inch sections, ″.03, ″.10, ″.48, ″.30, ″.04.
Minimum diameter, ″.58.
Sectional area, .264 square inch. Contraction, 43.2 per cent.
Test completed on the cold bar 70° Fahr. Micrometer observations made to determine present elastic limit.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	.....	0.	0.	Initial load.
15,030	.....	.0079	.....	
16,000	.....	.0084	.....	
16,500	62,500	.0087	.....	Elastic limit on reduced area.
	Load fell.			
16,000	.....	.0167	.....	
16,500	.....	.0191	.....	
17,000	.....	.0238	.....	
18,000	.....	.0327	.....	
19,000	.....	.0438	.....	
20,000	.....	.0621	.....	
21,000	.....	.085	.....	
22,000	.....	.12	.....	
23,000	.....	.18	.....	
23,160	87,730	.22	.....	Tensile strength on reduced area.
20,100	132,230	.....	.....	At time of fracture.
0	0	1.29	.....	=25.8 per cent. total elongation.

Fractured 2″.75 from neck. Appearance, silky.
Local contraction, 1″.8 each side of fracture.
Diameter at fracture, ″.44. Area, .152 square inch. Contraction from original area, 69.6 per cent.
Elongation of inch sections, ″.04, ″.11, ″.73*, ″.36, ″.05.

No. 1874.

Marks, 3–782.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0540 in 6 inches.
Estimated temperature, 1451° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
1,500	3,000	.0011	.....	
2,000	4,000	.0016	.....	
2,500	5,000	.0019	.....	
3,000	6,000	.0026	.....	
3,500	7,000	.0036	.....	
4,000	8,000	.0048	.....	Elastic limit (not well defined.)
4,500	9,000	.0067	.....	
5,000	10,000	.0093	.....	
5,500	11,000	.0134	.....	
6,000	12,000	.0191	.....	
6,500	13,000	.0287	.....	
7,000	14,000	.0446	.....	
7,500	15,000	.0771	.....	
8,000	16,000	.1357	.....	
8,260	16,520	.225	.....	Tensile strength.
0	0	1.17	.....	= 23.4 per cent.

Fracture not completed. Stress released just before fracture was expected.

Minimum diameter 1″.20 from the neck, ″.19. Sectional area, .028 square inch. Contraction, 94.4 per cent.

Surface of stem, blue-back color.

Local contraction reaches to the neck, and 1″.4 along the stem from the place of minimum diameter.

Elongation of inch sections, ″.01, ″.02, ″.03, ″.13, ″.98*.

No. 1877.

Marks, 3–782.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0585 in 6 inches.
Estimated temperature 1566° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
		.0007		After ¼ minute.
1,500	3,000	.0015		
		.0017		Do.
2,000	4,000	.0024		Elastic limit.
		.0027		After ¼ minute.
2,500	5,000	.0041		
		.0048		Do.
3,000	6,000	.0061		
		.0076		Do.
3,500	7,000	.0096		
		.0121		Do.
		.0144		After 1 minute.
		.0186		After 2 minutes.
		.0224		After 3 minutes.
		.0266		After 4 minutes.
		.0305		After 5 minutes.
4,000	8,000	.0332		
		.0377		After ¼ minute.
		.0434		After 1 minute.
		.0497		After 2 minutes.
		.0561		After 3 minutes
		.0665		After 4 minutes.
		.0749		After 5 minutes.
4,500	9,000	.0787		
		.0879		After ¼ minute.
		.0955		After 1 minute.
		.1145		After 2 minutes.
		.1349		After 3 minutes.
		.1552		After 4 minutes.
		.1762		After 5 minutes.
		.1985		After 6 minutes.
		.2205		After 7 minutes.
		.2445		After 8 minutes.
		.2695		After 9 minutes.
		.2951		After 10 minutes.
		.3255		After 11 minutes.
		.3560		After 12 minutes.
		.39		After 13 minutes.
		.43		After 14 minutes.
		.48		After 15 minutes.
		.53		After 16 minutes.
		.60		After 17 minutes.
		.71		After 18 minutes.
		1.00		After 19 minutes.
4,500	9,000			Tensile strength.
Hot test discontinued.				
0	0	.98		= 19.6 per cent.

Elongation of inch sections, ″.02, ″.14, ″.64, ″.11, ″.07.
Minimum diameter, ″.50. Area, .196 square inch. Contraction, 60.8 per cent.

No. 1877—Continued.

After a rest of two hours bar again loaded and ruptured at 70° Fahr.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
11, 700	59, 090	.....	.....	Elastic limit on reduced area.
16, 880	86, 120	.....	.....	Tensile strength on reduced area.
14, 500	134, 260	.....	.....	At time of fracture.
0	0	1.20	.....	= 24 per cent. total elongation.

Fractured 3″ from neck. Appearance, silky.

Local contraction, 1″.4 each side of fracture.

Diameter at fracture, ″.37. Area, .108 square inch. Contraction, 78.4 per cent.

Elongation of inch sections, ″.02, ″.15, ″.85*, ″.12, ″.06.

No. 1873.

Marks, 3–782.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0606 in 6 inches.
Estimated temperature, 1620° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
1,500	3,000	.0012	.....	
2,000	4,000	.0018	.....	Probable elastic limit.
2,500	5,000	.0034	.....	
2,800	5,600	.0051	.....	
3,000	6,000	.0068	.....	
3,500	7,000	.0120	.....	
4,000	8,000	.0222	.....	
4,500	9,000	.0437	.....	
5,000	10,000	.0752	.....	
5,260	10,520	.1370	.....	
5,500	11,000	.2039	.....	
5,680	11,360	.395	.....	Tensile strength.
0	0	1.88	.....	=36.0 per cent.

Minimum diameter 3″ from neck ″.17.
Sectional area, .023 square inch. Contraction, 95.4 per cent.
The fracture of this specimen was not completed in the testing machine, but the stress was released when the metal was down to the above-mentioned diameter.
Surface of stem, blue-black color.
Local contraction 2″ each side of minimum section.
Elongation of inch sections, ″.03, ″.11, 1″.13,* ″.45, ″.08.

No. 1773.

Marks, 4–795.
Diameter, ″.798.
Sectional area, .50 square inch.
Temperature, 0 Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
2,000	4,000	.0001	.....	
10,000	20,000	.0017	.....	
15,000	30,000	.0037	.....	
20,000	40,000	.0053	.....	
21,000	42,000	.0055	.....	
22,000	44,000	.0058	.....	
23,000	46,000	.0063	.....	
24,000	48,000	.0063	.....	
25,000	50,000	.0065	.....	
25,200	50,400	.0066	.....	Elastic limit.
	Load fell.			
23,000	46,000	.0167	.....	
24,000	48,000	.0240	.....	
25,000	50,000	.0588	.....	
26,000	52,000	.0659	.....	
27,000	54,000	.0745	.....	
28,000	56,000	.0848	.....	
29,000	58,000	.0954	.....	
30,600	60,000	.1066	.....	
31,000	62,000	.1184	.....	
32,000	64,000	.1313	.....	
33,000	66,000	.1443	.....	
34,000	68,000	.1581	.....	
35,000	70,000	.1738	.....	
36,000	72,000	.20	.....	
37,000	74,000	.22	.....	
38,000	76,000	.24	.....	
39,000	78,000	.275	.....	
40,000	80,000	.30	.....	
41,000	82,000	.335	.....	
42,000	84,000	.38	.....	
43,000	86,000	.47	.....	
44,000	88,000	.59	.....	
44,540	89,080	.82	.....	Tensile strength.
38,600	119,880	.....	.....	At time of rupture.
0	0	1.11	.....	= 22.2 per cent.

Fractured 2″.5 from neck, at center-punch mark. Appearance granular, radiating from center-punch mark in the circumference.

Minimum diameter, $\frac{1}{4}$″ from the place of rupture. Local contraction, 1″ each side of this point.

Diameter at fracture, ″.64. Area, .322 square inch. Contraction, 35.6 per cent.

Elongation of inch sections, ″.11, ″.16, ″.32*, ″.37*, ″.15.

No. 1810.

Marks, 4–795.
Diameter, ″.798.
Sectional area, .50 square inch.
Temperature, 70° Fahr.
Gauged length, 5″.

Applied loads.		In gauged lengths.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
5,000	10,000	.0012	.....	
10,000	20,000	.0029	.....	
15,000	30,000	.0046	.....	
20,000	40,000	.0063	.....	
23,000	46,000	.0074	.....	
24,000	48,000	.0079	.....	Elastic limit.
Load fell.				
22,500	45,000	.0422	.....	
23,000	46,000	.0503	.....	
24,000	48,000	.0567	.....	
25,000	50,000	.0658	.....	
26,000	52,000	.0749	.....	
27,000	54,000	.0856	.....	
28,000	56,000	.0952	.....	
29,000	58,000	.1079	.....	
30,000	60,000	.1204	.....	
31,000	62,000	.14	.....	
32,000	64,000	.15	.....	
33,000	66,000	.165	.....	
34,000	68,000	.185	.....	
35,000	70,000	.205	.....	
36,000	72,000	.225	.....	
37,000	74,000	.255	.....	
38,000	76,000	.28	.....	
39,000	78,000	.32	.....	
40,000	80,000	.37	.....	
41,000	82,000	.44	.....	
42,000	84,000	.54	.....	
42,900	85,800	.....	.....	Tensile strength.
36,900	135,160	.....	.....	At time of fracture.
0	0	1.20	.....	=24.0 per cent.

Fractured 2″.5 from neck at center-punch mark. Appearance, silky. Diameter at fracture, ″.59. Area, .273 square inch. Contraction, 45.4 per cent.

Elongation of inch sections, ″.14, ″.18, ″.37*, ″.36, ″.15.

No. 1764.

Marks, 4–795.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0058 in 6 inches.
Estimated temperature, 215° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
2,000	4,000	0.	0.	Initial load.
5,000	10,000	.0008	.....	
10,000	20,000	.0019	.....	
15,000	30,000	.0030	.....	
20,000	40,000	.0041	.....	
21,000	42,000	.0045	.....	
22,000	44,000	.0046	.....	
21,500	45,000	.0048	.....	
22,600	45,200	.0051	.....	Elastic limit.
Load fell.				
21,000	42,000	.0177	.....	
22,000	44,000	.0452	.....	
23,000	46,000	.0458	.....	
24,000	48,000	.0487	.....	
25,000	50,000	.0710	.....	
26,000	52,000	.0769	.....	
27,000	54,000	.0782	.....	
28,000	56,000	.0995	.....	
29,000	58,000	.1081	.....	
30,000	60,000	.1098	.....	
31,000	62,000	.1516	.....	
32,000	64,000	.1585	.....	
33,000	66,000	.1665	.....	
34,000	68,000	.1803	.....	
36,000	72,000	.195	.....	
37,000	74,000	.27	.....	
38,000	76,000	.325	.....	
39,000	78,000	.33	.....	
40,000	80,000	.36	.....	
41,000	82,000	.555	.....	
41,700	83,400	.69	.....	Tensile strength.
39,200	125,640	.....	.....	At time of fracture.
0	0	.88	.....	= 17.6 per cent.

Fractured 1″.30 from neck at center-punch mark. Appearance, silky.
Local contraction, 1″.1 each side of fracture.
Diameter at fracture, ″.63. Area, .312 square inch. Contraction, 37.6 per cent.
Elongation of inch sections, ″.30*, ″.22*, ″.13, ″.13, ″.10.

No. 1763.

Marks, 4-795.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0099 in 6 inches.
Estimated temperature, 317° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
5,000	10,000	.0020	.....	
15,000	30,000	.0026	.....	
20,000	40,000	.0045	.....	
21,000	42,000	.0049	.....	Elastic limit.
22,000	44,000	.0080	.....	
		.0347	.....	
23,000	46,000	.0351	.....	
24,000	48,000	.0379	.....	Throbs.
25,000	50,000	.0410	.....	
26,000	52,000	.0561	.....	
27,000	54,000	.0591	.....	
28,000	56,000	.0630	.....	
29,000	58,000	.0694	.....	Do.
30,000	60,000	.0803	.....	
31,000	62,000	.0881	.....	
32,000	64,000	.0882	.....	
33,000	66,000	.1250	.....	
37,000	74,000	.1520	.....	
38,000	76,000	.155	.....	
39,000	78,000	.19	.....	
40,000	80,000	.19	.....	
41,000	82,000	.20	.....	
42,000	84,000	.225	.....	
43,000	86,000	.265	.....	
44,000	88,000	.295	.....	Tensile strength.
		.355		
62,000	120,430	.....	.....	At time of rupture.
0	0	.61	.....	=12.2 per cent.

Fractured 1″.25 from neck at center-punch mark. Appearance, silky.
Local contraction, 1″ each side of fracture.
Diameter at fracture, ″.64. Area, .322 square inch. Contraction, 35.6 per cent.
Elongation of inch sections, ″.08, ″.07, ″.06, ″.16*, ″.24*.

No. 1767.

Marks, 4–795.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0148 in 6 inches.
Estimated temperature, 440° Fahr.
Guaged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
5,000	10,000	.0013	.....	
10,000	20,000	.0029	.....	
15,000	30,000	.0042	.....	
20,000	40,000	.0053	.....	
21,400	42,800	.0059	.....	
22,400	44,800	.0090	.....	Elastic limit.
Load fell.				
21,000	42,000	.0100	.....	
21,500	43,000	.0188	.....	
22,000	44,000	.0292	.....	
24,000	48,000	.0374	.....	
26,000	52,000	.0463	.....	
28,000	56,000	.0602	.....	
30,000	60,000	.0730	.....	
32,000	64,000	.0867	.....	
34,000	68,000	.1020	.....	
36,000	72,000	.12	.....	
38,000	76,000	.135	.....	
40,000	80,000	.165	.....	
42,000	84,000	.18	.....	
44,000	88,000	.225	.....	
46,000	92,000	.28	.....	
47,000	94,000	.30	.....	
48,000	96,000	.35	.....	
49,000	98,000	.43	.....	
49,490	98,980	.53	.....	Tensile strength.
45,900	134,210	.....	.....	At time of fracture.
0	0	.60	.....	=13.8 per cent.

Fractured 1″.20 from neck. Appearance, silky. Oblique, 48°. No change in color. Surface of stem straw colored.

Local contraction, ″.8 each side of fracture.

Diameter at fracture, ″.66. Area, .342 square inch. Contraction, 31.6 per cent.

Elongation of inch sections, ″.09, ″.09, ″.10, ″.16*, ″.25*.

No. 1765.

Marks, 4–795.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0200 in 6 inches.
Estimated temperature, 570° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
5,000	10,000	.0014	.....	
10,000	20,000	.0029	.....	
15,000	30,000	.0046	.....	
16,000	32,000	.0050	.....	
17,000	34,000	.0056	.....	
18,000	36,000	.0063	.....	Elastic limit.
18,500	37,000	.0090	.....	
19,000	38,000	.0158	.....	
19,500	39,000	.0188	.....	
20,000	40,000	.0215	.....	
22,000	44,000	.0326	.....	
24,000	48,000	.0486	.....	
26,000	52,000	.0580	.....	
28,000	56,000	.0731	.....	
30,000	60,000	.0866	.....	
32,000	64,000	.10	.....	
34,000	68,000	.125	.....	
36,000	72,000	.14	.....	
38,000	76,000	.17	.....	
40,000	80,000	.195	.....	
42,000	84,000	.225	.....	
44,000	88,000	.275	.....	
46,000	92,000	.32	.....	
47,000	94,000	.37	.....	
48,000	96,000	.41	.....	
49,000	98,000	.51	.....	
49,720	99,440	.67	.....	Tensile strength.
43,100	142,720	.....	.....	At time of fracture.
0	0	.91	.....	= 18.2 per cent.

Fractured 1″ from neck. Appearance silky.
Local contraction, 1″ each side of fracture.
Diameter at fracture, ″.62. Area, .302 square inch. Contraction, 39.6 per cent.
Elongation of inch sections, ″.38*, ″.18, ″.13, ″.12, ″.10.

No. 1780.

Marks, 4–795.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0225 in 6 inches.
Estimated temperature, 632° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
5,000	10,000	.0006	.....	
10,000	20,000	.0020	.....	
15,000	30,000	.0044	.....	
15,500	31,000	.0047	.....	
16,000	32,000	.0054	.....	Elastic limit.
16,500	33,000	.0073	.....	
17,000	34,000	.0097	.....	
17,500	35,000	.0117	.....	
18,000	36,000	.0140	.....	
19,000	38,000	.0181	.....	
20,000	40,000	.0228	.....	
22,000	44,000	.0363	.....	
24,000	48,000	.0485	.....	
26,000	52,000	.0612	.....	
28,000	56,000	.0765	.....	
30,000	60,000	.0916	.....	
32,000	64,000	.1090	.....	
34,000	68,000	.1281	.....	
36,000	72,000	.1514	.....	
38,000	76,000	.18	.....	
40,000	80,000	.215	.....	
42,000	84,000	.26	.....	
44,000	88,000	.33	.....	
45,000	90,000	.37	.....	
46,000	92,000	.42	.....	
47,000	94,000	.50	.....	Tensile strength hot.
		.02	.....	Load released and specimen removed from machine.
0	0	.60	.....	=12.0 per cent.

Surface of stem blue-black color.
Elongation of inch sections, ″.11, ″.13, ″.14, ″.12, ″.10.
After a rest of twenty hours bar tested cold at temperature of 65° Fahr.
Minimum diameter, ″.740. Area, .430. square inch. Contraction, 14 per cent.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
48,000	96,000	.625	.....	
49,000	98,000	.625	.....	
50,000	100,000	.625	.....	
51,000	102,000	.625	.....	
52,000	104,000	.63	.....	
53,000	106,000	.63	.....	
54,000	108,000	.635	.....	
		.65	.....	Tensile strength.
54,200	108,400	.....	.....	On original section.
	126,050	.....	.....	On reduced section.
46,000	138,550	.....	.....	At time of fracture.
0	0	.76	.....	=15.2 per cent.

Fractured ″.50 from neck. Appearance, fine granular, radiating from a silky spot at the center.
Local contraction reaches to the neck and ″.7 from fracture.
Diameter at fracture, ″.65. Area, .332 square inch. Contraction, 33.6 per cent.
Elongation of inch sections, ″.11, ″.13, ″.14, ″.12, ″.26*.

No. 1779.

Marks, 4–795.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0229 in six inches.
Estimated temperature, 642° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
5,000	10,000	.0018	.....	
15,000	30,000	.0058	.....	
16,000	32,000	.0062	.....	Elastic limit.
16,500	33,000	.0070	.....	
17,000	34,000	.0108	.....	
17,500	35,000	.0125	.....	
18,000	36,000	.0151	.....	
19,000	38,000	.0203	.....	
20,000	40,000	.0240	.....	
21,000	42,000	.0313	.....	
22,000	44,000	.0382	.....	
24,000	48,000	.0500	.....	
26,000	52,000	.0626	.....	
28,000	56,000	.0783	.....	
30,000	60,000	.0935	.....	
32,000	64,000	.1086	.....	
33,000	66,000	.13	.....	
36,000	72,000	.155	.....	
38,000	76,000	.185	.....	
40,000	80,000	.21	.....	
42,000	84,000	.245	.....	
44,000	88,000	.30	.....	
45,000	90,000	.335	.....	
46,000	92,000	.375	.....	
47,000	94,000	.435	.....	
48,000	96,000	.545	.....	
48,350	96,700	.605	.....	Tensile strength.
38,400	140,660	.....	.....	At time of fracture.
0	0	1.03	.....	= 20.6 per cent.

Fractured 1″.75 from neck. Appearance, silky; deep blue color. Cup-shaped ends. Surface of stem brown, with irregular checkered spots of blue-black.

Local contraction, ″.9 each side of fracture.

Diameter at fracture, ″.59. Area, .273 square inch. Contraction, 45.4 per cent.

Elongation of inch sections, ″.23, ″.44*, ″.16, ″.11, ″.09.

No. 1882.

Marks, 4–795.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0268 in 6 inches.
Estimated temperature, 740° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
11,000	22,000	.0048	.....	
12,000	24,000	.0053	.....	
13,000	26,000	.0057	.....	Elastic limit (not well defined.)
14,000	28,000	.0069	.....	
15,000	30,000	.0086	.....	
16,000	32,000	.0114	.....	
17,000	34,000	.0146	.....	
18,000	36,000	.0185	.....	
19,000	38,000	.0232	.....	
20,000	40,000	.0282	.....	
21,000	42,000	.0345	.....	
22,000	44,000	.0409	.....	
24,000	48,000	.0546	.....	
26,000	52,000	.0683	.....	
28,000	56,000	.0849	.....	
30,000	60,000	.1032	.....	
32,000	64,000	.1235	.....	
34,000	68,000	.1497	.....	
35,000	70,000	.1624	.....	
36,000	72,000	.1780	.....	
37,000	74,000	.1957	.....	
38,000	76,000	.2159	.....	
39,000	78,000	.2416	.....	
40,000	80,000	.2774	.....	
41,000	82,000	.3224	.....	
41,500	83,000	.43	.....	Tensile strength.
		.47	.....	
41,000	.....	.....	.....	Test discontinued.
0	0	.59	.....	=10.6 per cent.

Elongation of inch sections, ″.07, ″.16, ″.17, ″.08, ″.05.

Minimum diameter, ″.72. Area, .407 square inch. Contraction, 18.6 per cent.

Rested sixteen hours and then test completed at temperature of 70° Fahr.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
47,000	94,000	.....	.....	Elastic limit; rapid stretching.
	115,480	.....	.....	On original area.
	.....	.....	.....	On reduced area.
49,460	98,920	.....	.....	Tensile strength.
	121,520	.....	.....	On original area.
43,100	142,720	.....	.....	On reduced area.
0	0	.83	.....	At time of fracture.
				=16.6 per cent.

Fractured 2″.5 from neck. Appearance, fine granular, radiating from silky center.

Local contraction, ″.9 each side of fracture.

Diameter at fracture, ″.62. Area, .302 square inch. Contraction, 39.6 per cent.

Elongation of inch sections, ″.10, ″.22, ″.31*, ″.11, ″.09.

No. 1766.

Marks, 4–795.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0275 in 6 inches.
Estimated temperature, 757° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
5,000	10,000	.0017	.....	
10,000	20,000	.0030	.....	
13,000	26,000	.0045	.....	
14,000	28,000	.0054	.....	Elastic limit.
14,500	29,000	.0065	.....	
15,000	30,000	.0082	.....	
15,500	31,000	.0094	.....	
16,000	32,000	.0107	.....	
17,000	34,000	.0136	.....	
18,000	36,000	.0180	.....	
19,000	38,000	.0228	.....	
20,000	40,000	.0283	.....	
22,000	44,000	.0418	.....	
24,000	48,000	.0563	.....	
26,000	52,000	.0700	.....	
28,000	56,000	.0876	.....	
30,000	60,000	.1029	.....	
32,000	64,000	.125	.....	
34,000	68,000	.15	.....	
36,000	72,000	.18	.....	
38,000	76,000	.22	.....	
40,000	80,000	.255	.....	
41,000	82,000	.28	.....	
42,000	84,000	.31	.....	
43,000	86,000	.37	.....	
44,000	88,000	.43	.....	
45,000	90,000	.56	.....	
45,460	90,920	.66	.....	Tensile strength.
22,500	94,540	.....	.....	At time of fracture.
0	0	1.20	.....	=24.0 per cent.

Fractured 1″.40 from neck. Appearance, silky; dark-blue color. Surface of stem, blue-black, with purple cast.

Local contraction, 1″ each side of fracture.

Diameter at fracture, ″.55. Area, .238 square inch. Contraction, 52.4 per cent.

Elongation of inch sections, ″.14, ″.17, ″ .18, ″.41*, ″.30.

No. 1768.

Marks, 4–795.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0337 in 6 inches.
Estimated temperature, 912° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
5,000	10,000	.0014	.....	
10,000	20,000	.0039	.....	
12,000	24,000	.0060	.....	
12,500	25,000	.0067	.....	
13,000	26,000	.0074	.....	Elastic limit.
13,500	27,000	.0084	.....	
14,000	28,000	.0094	.....	
14,500	29,000	.0105	.....	
15,000	30,000	.0119	.....	
15,500	31,000	.0134	.....	
16,000	32,000	.0152	.....	
17,000	34,000	.0200	.....	
18,000	36,000	.0246	.....	
19,000	38,000	.0318	.....	
20,000	40,000	.0380	.....	
22,000	44,000	.0543	.....	
24,000	48,000	.0722	.....	
26,000	52,000	.095	.....	
28,000	56,000	.125	.....	
30,000	60,000	.15	.....	
31,000	62,000	.175	.....	
32,000	64,000	.185	.....	
33,000	66,000	.215	.....	
34,000	68,000	.25	.....	
35,000	70,000	.295	.....	
36,000	72,000	.355	.....	
36,680	73,360	.49	.....	Tensile strength.
20,000	105,820	.....	.....	At time of fracture.
0	0	1.16	.....	=23.2 per cent.

Fractured 3″ from neck. Appearance, silky; dark-blue color. Cup-shaped ends. Surface of stem, blue-black.

Local contraction, 1″.1 each side of fracture.

Diameter at fracture, ″.49. Area, .189 square inch. Contraction, 62.2 per cent.

Elongation of inch sections, ″.10, ″.21, ″.63*, ″.14, ″.08.

No. 1769.

Marks, 4–795.
Diameter, ″798.
Sectional area, .50 square inch.
Expansion, ″.0380 in 6 inches.
Estimated temperature, 1020° Fahr.
Gauged length, 5″.

Applied load.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
5,000	10,000	0.	0.	Initial load.
9,500	19,000	.0022	.....	
10,000	20,000	.0025	.....	
10,500	21,000	.0027	.....	
11,000	22,000	.0032	.....	Elastic limit.
11,500	23,000	.0039	.....	
12,000	24,000	.0046	.....	
12,500	25,000	.0053	.....	
13,000	26,000	.0060	.....	
13,500	27,000	.0071	.....	
14,000	28,000	.0086	.....	
14,500	29,000	.0096	.....	
15,000	30,000	.0115	.....	
16,000	32,000	.0159	.....	
17,000	34,000	.0209	.....	
18,000	36,000	.0282	.....	
19,000	38,000	.0376	.....	
20,000	40,000	.0448	.....	
21,000	42,000	.0542	.....	
22,000	44,000	.0651	.....	
23,000	46,000	.0790	.....	
24,000	48,000	.0928	.....	
25,000	50,000	.1061	.....	
26,000	52,000	.13	.....	
27,000	54,000	.155	.....	
28,000	56,000	.165	.....	
29,000	58,000	.195	.....	
30,000	60,000	.225	.....	
31,000	62,000	.27	.....	
32,000	64,000	.33	.....	
32,300	64,600	.415	.....	Tensile strength.
19,500	39,490	.....	.....	At time of fracture.
0	0	.74	.....	=14.8 per cent.

Fractured ″.70 from neck. Appearance, silky.
Local contraction reaches to the neck and 1″ from fracture.
Diameter at fracture, ″.50. Area, .196 square inch. Contraction, 60.8 per cent.
Elongation of inch sections, ″.08, ″.06, ″.06, ″.06,″.48*.

No. 1881.

Marks, 4–795.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0393 in 6 inches.
Estimated temperature, 1052° Fahr.
Gauged length 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
10,000	20,000	.0042	.....	
11,000	22,000	.0055	.....	
12,000	24,000	.0069	.....	
13,000	26,000	.0086	.....	Elastic limit.
14,000	28,000	.0117	.....	
15,000	30,000	.0152	.....	
16,000	32,000	.0215	.....	
17,000	34,000	.0296	.....	
18,000	36,000	.0408	.....	
19,000	38,000	.0522	.....	
20,000	40,000	.0674	.....	
21,000	42,000	.0943	.....	
22,000	44,000	.1167	.....	
22,650	45,300	.1763	.....	Tensile strength.
Descending loads and elongations.				
22,000	.....	.2327	.....	
21,500	.....	.2550	.....	
21,000	.....	.2773	.....	Test discontinued.
0	0	.27	.....	= 54.0 per cent.

Elongation of inch sections, ″.18, ″.03, ″.02, ″.02, ″.02.
Minimum diameter, ″.71. Area, .396 square inch. Contraction, 20.8 per cent.
Rested eighteen hours and test completed at temperature of 70° Fahr.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
5,000	.....	0.	0.	Initial load.
	.....	.....	.....	Elastic limit.
31,100	62,200	.....	.....	On original area.
	78,540	.....	.....	On reduced area.
32,000	.....	.0635	.....	
34,000	.....	.0895	.....	
36,000	.....	.1231	.....	
38,000	.....	.165	.....	
40,000	.....	.24	.....	
	.....	.31	.....	Tensile strength.
40,570	81,140	.....	.....	On original area.
	102,450	.....	.....	On reduced area.
37,900	133,920	.....	.....	At time of fracture.
0	0	.61	.....	= 12.2 per cent.

Fractured ″.50 from neck. Appearance, silky center 30 per cent., fine granular at circumference 70 per cent.
Local contraction to the neck, and ″.9 from the neck.
Diameter at fracture, ″.60. Area, .283 square inch. Contraction, 43.4 per cent.
Elongation of inch sections, ″.36*, ″.07, ″.06, ″.06, ″.06.

No. 1878.

Marks, 4–795.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0449 in 6 inches.
Estimated temperature, 1192° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
2,000	4,000	.0006	.....	
3,000	6,000	.0013	.....	
4,000	8,000	.0026	.....	
5,000	10,000	.0038	.....	
6,000	12,000	.0050	.....	
7,000	14,000	.0062	.....	
8,000	16,000	.0074	.....	Elastic limit.
9,000	18,000	.0093	.....	
10,000	20,000	.0119	.....	
11,000	22,000	.0167	.....	
12,000	24,000	.0244	.....	
13,000	26,000	.0388	.....	
14,000	28,000	.0529	.....	
15,000	30,000	.0691	.....	
16,000	32,000	.0940	.....	
17,000	34,000	.1274	.....	
18,000	36,000	.2068	.....	
18,760	37,520	.3604	.....	Tensile strength.
0	0	1.44	.....	=28.8 per cent.

Fractured 3″ from neck. Appearance, silky; dark-blue color. Surface of stem blue-black, with brownish tinge.

Local contraction, 1″.6 each side of fracture.

Diameter at fracture, ″.35. Area, .096 square inch. Contraction, 80.8 per cent.

Elongation of inch sections, ″.06, ″.23, ″.96*, ″.16, ″.03.

No. 1879.

Marks, 4–795.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0486 in 6 inches.
Estimated temperature, 1285° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
2,000	4,000	.0011	.....	
3,000	6,000	.0017	.....	
4,000	8,000	.0030	.....	
5,000	10,000	.0044	.....	
6,000	12,000	.0059	.....	Elastic limit.
7,000	14,000	.0079	.....	
8,000	16,000	.0116	.....	
9,000	18,000	.0167	.....	
10,000	20,000	.0273	.....	
11,000	22,000	.0427	.....	
12,000	24,000	.0696	.....	
13,000	26,000	.1065	.....	
13,940	27,880	.2304	.....	Tensile strength.
0	0	1.08	.....	= 21.6 per cent.

Fractured at middle of stem. Appearance, silky; blue-black color. Surface of stem, blue-black.

Local contraction, 1″.8 each side of fracture.

Diameter at fracture, ″.30. Area, .071 square inch. Contraction, 85.8 per cent.

Elongation of inch sections, ″.01, ″.09, ″.84*, ″.10, ″.04.

No. 1781.

Marks, 4–795.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0530 in 6 inches.
Estimated temperature, 1395° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
2,000	4,000	.0018	.....	
3,000	6,000	.0027	.....	No well-defined elastic limit.
4,000	8,000	.0045	.....	
4,500	9,000	.0055	.....	
5,000	10,000	.0066	.....	
5,500	11,000	.0072	.....	
6,000	12,000	.0088	.....	
6,500	13,000	.0102	.....	
7,000	14,000	.0113	.....	
7,500	15,000	.0129	.....	
8,000	16,000	.0143	.....	
9,000	18,000	.0201	.....	
10,000	20,000	.0247	.....	
11,000	22,000	.0351	.....	
12,000	24,000	.0480	.....	
13,000	26,000	.0571	.....	
14,000	28,000	.0998	.....	
15,000	30,000	.1367	.....	
16,000	32,000	.1936	.....	
17,000	34,000	.2729	.....	
18,000	36,000	.36	.....	
18,400	36,800	.60	.....	Tensile strength.
0	0	1.48	.....	= 29.6 per cent.

Fractured 3″ from neck. Appearance, silky; dark blue. Surface of stem, dark blue. Raised a scale.

Local contraction, 1″.5 each side of fracture.

Diameter at fracture, ″.36. Area, .102 square inch. Contraction, 79.6 per cent.

Elongation of inch sections, ″.07, ″.14, ″.84*, ″.35, ″.08.

No. 1880.

Marks, 4–795.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0584 in 6 inches.
Estimated temperature, 1530° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
1,500	3,000	.0015	.....	
2,000	4,000	.0022	.....	Elastic limit uncertain.
2,500	5,000	.0032	.....	
3,000	6,000	.0050	.....	
3,500	7,000	.0076	.....	
4,000	8,000	.0108	.....	
4,500	9,000	.0167	.....	
5,000	10,000	.0319	.....	
5,500	11,000	.0674	.....	
5,970	11,940	.1545	.....	Tensile strength.
		.2470	.....	Test discontinued, specimen still stretching under the maximum load.
0	0	.27	.....	= 5.4 per cent.

Elongation of inch sections, ″.03, ″.05, ″.09, ″.06, ″.04.
Minimum diameter, ″.767.
Sectional area, .462 square inch.
Contraction, 7.6 per cent.
Rested 20 hours and test completed at temperature of 70° Fahr.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
10,000	.....	0.	0.	Initial load.
15,000	.....	.0015	.....	
20,000	.....	.0019	.....	
24,000	.....	.0029	.....	
24,900	.....	.....	.....	Elastic limit.
	49,800	.....	.....	On original area.
	53,900	.....	.....	On reduced area.
Load fell.				
21,000	.....	.0147	.....	
21,500	.....	.0191	.....	
22,000	.....	.0301	.....	
25,000	.....	.0808	.....	
28,000	.....	.13	.....	
30,000	.....	.17	.....	
32,000	.....	.225	.....	
34,000	.....	.295	.....	
36,000	.....	.40	.....	
37,000	.....	.51	.....	
37,350	.....	.63	.....	Tensile strength.
	74,700	.....	.....	On original area.
	80,840	.....	.....	On reduced area.
33,600	131,760	.....	.....	At time of fracture.
0	0	1.06	.....	= 21.2 per cent.

Fractured at middle of stem. Appearance, silky.
Local contraction, 1″ each side of fracture.
Diameter at fracture, ″.57. Area, .225 square inch.
Contraction, 49.0 per cent.
Elongation of inch sections, ″.10, ″.18, ″.52*, ″.17, ″.09.

No. 1782.

Marks, 4–795.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0601 in 6 inches.
Estimated temperature, 1572° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
500	1,000	0.	0.	Initial load.
1,000	2,000	.0011	.....	
1,500	3,000	.0025	.....	No well-defined elastic limit.
2,000	4,000	.0041	.....	
2,500	5,000	.0057	.....	
3,000	6,000	.0082	.....	
3,500	7,000	.0122	.....	
4,000	8,000	.0190	.....	
4,500	9,000	.0334	.....	
5,000	10,000	.0595	.....	
5,500	11,000	.1051	.....	
6,000	12,000	.1957	.....	
6,500	13,000	.24	.....	
6,850	13,700	.71	.....	Tensile strength.
0	0	2.71	.....	= 54.2 per cent.

Fractured 3″.5 from neck. Appearance, silky. Contains small cavities. Cup-shaped; both ends concave.

Surface of fracture and stem, blue-black color, with red streaks on surface. Raised a scale.

A center-punch mark ″.60 from the point of rupture, originally ″.03 diameter on the surface of the stem, was elongated till its major diameter was ″.086.

Diameter at fracture, ″.12. Area, .011 square inch. Contraction, 98.9 per cent.

Elongation of inch sections, ″.12, ″.75, 1″.63*, ″.18, ″.03.

No. 1774.

Marks, 5–803.
Diameter, ″.798.
Sectional area, .50 square inch.
Temperature, 5° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
2,000	4,000	.0021	.....	
5,000	10,000	.0053	.....	
10,000	20,000	.0085	.....	
15,000	30,000	.0104	.....	
20,000	40,000	.0126	.....	
25,000	50,000	.0145	.....	
27,000	54,000	.0145	.....	
28,000	56,000	.0146	.....	
29,000	58,000	.0149	.....	Elastic limit.
	Load fell.			
26,500	53,000	.0199	.....	
27,000	54,000	.0205	.....	
28,000	56,000	.0418	.....	
29,000	58,000	.0586	.....	
30,000	60,000	.0665	.....	
31,000	62,000	.0754	.....	
32,000	64,000	.0836	.....	
33,000	66,000	.0932	.....	
34,000	68,000	.1033	.....	
35,000	70,000	.1135	.....	
36,000	72,000	.1245	.....	
37,000	74,000	.1347	.....	
38,000	76,000	.1474	.....	
39,000	78,000	.1601	.....	
40,000	80,000	.1734	.....	
41,000	82,000	.19	.....	
42,000	84,000	.205	.....	
43,000	86,000	.22	.....	
44,000	88,000	.245	.....	
45,000	90,000	.27	.....	
46,000	92,000	.30	.....	
47,000	94,000	.345	.....	
48,000	96,000	.405	.....	
49,000	98,000	.48	.....	
49,700	99,400	.69	.....	Tensile strength.
41,000	160,780	.....	.....	At time of fracture.
0	0	1.03	.....	=20.6 per cent.

Fractured 2″.1 from neck. Appearance, silky.
Local contraction, ″.9 each side of fracture.
Diameter at fracture, ″.57. Area, .255 square inch. Contraction, 49.0 per cent.
Elongation of inch sections, ″.10, ″.15, ″.20, ″.45*, ″.13.

No. 1811.

Marks, 5–803.
Diameter, ″.798.
Sectional area, .50 square inch.
Temperature, 70° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
5,000	10,000	.0013	.....	
10,000	20,000	.0031	.....	
15,000	30,000	.0048	.....	
20,000	40,000	.0065	.....	
25,000	50,000	.0083	.....	
28,000	56,000	.....	.....	Elastic limit. Sustained this load momentarily, then load fell.
26,080	52,000	.0300	.....	
27,000	54,000	.0483	.....	
28,000	56,000	.0556	.....	
29,000	58,000	.0649	.....	
30,000	60,000	.0729	.....	
31,000	62,000	.0819	.....	
32,000	64,000	.0924	.....	
33,000	66,000	.1033	.....	
34,000	68,000	.1142	.....	
35,000	70,000	.1259	.....	
36,000	72,000	.1385	.....	
37,000	74,000	.1539	.....	
38,000	76,000	.1669	.....	
39,000	78,000	.18	.....	
40,000	80,000	.195	.....	
41,000	82,000	.22	.....	
42,000	84,000	.24	.....	
43,000	86,000	.26	.....	
44,000	88,000	.31	.....	
45,000	90,000	.34	.....	
46,000	92,000	.41	.....	
47,000	94,000	.51	.....	
47,820	95,640	.....	.....	Tensile strength.
41,200	150,910	.....	.....	At time of fracture.
0	0	1.10	.....	=22.0 per cent.

Fractured 2″.75 from neck. Appearance, silky.
Diameter at fracture, ″.59. Area, .273 square inch. Contraction, 45.4 per cent.
Elongation of inch sections, ″.12, ″.26, ″.42*, ″.17, ″.13.

No. 1783.

Marks, 5–803.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0080 in 6 inches.
Estimated temperature, 272° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
5,000	10,000	.0014	.....	
10,000	20,000	.0032	.....	
15,000	30,000	.0047	.....	
20,000	40,000	.0061	.....	
21,000	42,000	.0064	.....	
22,000	44,000	.0069	.....	
23,000	46,000	.0075	.....	
24,000	48,000	.0079	.....	
25,000	50,000	.0080	.....	
25,700	51,400	.....	.....	Elastic limit.
	Load fell.			
24,500	49,000	.0123	.....	
25,000	50,000	.0134	.....	
		.0392	.....	
27,000	54,000	.0401	.....	
28,000	56,000	.0450	.....	
29,000	58,000	.0695	.....	
30,000	60,000	.0697	.....	
31,000	62,000	.0771	.....	Throbs.
32,000	64,000	.0813	.....	
33,000	66,000	.1054	.....	
34,000	68,000	.1145	.....	
35,000	70,000	.1252	.....	
36,000	72,000	.1437	.....	
37,000	74,000	.1484	.....	
38,000	76,000	.1631	.....	
39,000	78,000	.1828	.....	
40,000	80,000	.2068	.....	
43,000	86,000	.225	.....	
44,000	88,000	.34	.....	
45,000	90,000	.395	.....	
45,940	91,880	.535	.....	
47,000	94,000	.60	.....	
48,000	96,000	.61	.....	
48,600	97,200	.....	.....	Tensile strength.
41,800	147,700	.....	.....	At time of fracture.
0	0	.82	.....	= 16.4 per cent.

Fractured ″.85 from neck. Appearance, silky. No change in color. Surface of stem, light straw colored.

Local contraction, ″.8 each side of fracture.

Diameter at fracture, ″.60. Area, .283 square inch. Contraction, 43.4 per cent.

Elongation of inch sections, ″.37*, ″.14, ″.13, ″.10, ″.07.

No. 1788.

Marks, 5–803.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0132 in 6 inches.
Estimated temperature, 448° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
5,000	10,000	.0030	.....	
10,000	20,000	.0051	.....	
15,000	30,000	.0074	.....	
20,000	40,000	.0086	.....	
23,000	46,000	.0099	.....	
23,500	47,000	.0101	.....	
24,000	48,000	.0104	.....	
24.500	49,000	.0105	.....	Elastic limit.
	Load fell.			
24,000	48,000	.0168	.....	
24,500	49,000	.0176	.....	
25,000	50,000	.0313	.....	
26,000	52,000	.0323	.....	
28,000	56,000	.0409	.....	
30,000	60,000	.0513	.....	
32,000	64,000	.0637	.....	
34,000	68,000	.0769	.....	
36,000	72,000	.0916	.....	
38,000	76,000	.1030	.....	
40,000	80,000	.1180	.....	
42,000	84,000	.1336	.....	
44,000	88,000	.1512	.....	
46,000	92,000	.165	.....	
48,000	96,000	.205	.....	
50,000	100,000	.25	.....	
51,000	102,000	.28	.....	
52,000	104,000	.33	.....	
52,800	105,600	.39	.....	
53,000	106,000	.44	.....	
54,000	108,000	.47	.....	
54,300	108,600	.58	.....	Tensile strength.
52,000	135,060	.....	.....	At time of fracture.
0	0	.64	.....	=12.8 per cent.

Fractured 2″.25 from neck. Appearance, silky, oblique. No change; in color.

Surface of stem, light straw color.

Local contraction, 1″ and ″.8 from fracture.

Diameter at fracture, ″.70. Area, .385 square inch. Contraction, 23.0 per cent.

Elongation of inch sections, ″.09, ″.09, ″.23*, ″.13, ″.10.

No. 1784.

Marks, 5–803.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0172 in 6 inches.
Estimated temperature, 503° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
2, 000	4, 000	0.	0.	Initial load.
3, 000	6, 000	.0012	.....	
5, 000	10, 000	.0022	.....	
10, 000	20, 000	.0045	.....	
15, 000	30, 000	.0064	.....	
20, 000	40, 000	.0084	.....	
21, 000	42, 000	.0090	.....	
22, 000	44, 000	.0099	.....	
22, 500	45, 000	.0106	.....	Elastic limit.
23, 000	46, 000	.0160	.....	
23, 500	47, 000	.0192	.....	
24, 000	48, 000	.0231	.....	
25, 000	50, 000	.0296	.....	
26, 000	52, 000	.0337	.....	
28, 000	56, 000	.0460	.....	
30, 000	60, 000	.0559	.....	
32, 000	64, 000	.0703	.....	
34, 000	68, 000	.0825	.....	
36, 000	72, 000	.0990	.....	
38, 000	76, 000	.1133	.....	
40, 000	80, 000	.1291	.....	
42, 000	84, 000	.16	.....	
44, 000	88, 000	.17	.....	
46, 000	92, 000	.20	.....	
48, 000	96, 000	.24	.....	
50, 000	100, 000	.275	.....	
52, 000	104, 000	.35	.....	
53, 000	106, 000	.40	.....	
54, 000	108, 000	.46	.....	
55, 000	110, 000	.59	.....	
55, 280	110, 560	.72	.....	Tensile strength.
51, 000	144, 480	.....	.....	At time of fracture.
0	0	.94	.....	= 18.8 per cent.

Fractured 2″.75 from neck at center-punch mark. Appearance, silky; oblique 50°; dark straw color with purple tinge.

Surface of stem varies from a straw to purple and blue color.

Local contraction, ″.8 each side of fracture.

Diameter at fracture, ″.67. Area, .353 square inch. Contraction, 29.4 per cent.

Elongation of inch sections, ″.12, ″.23*, ″.31*, ″.17, ″.11.

No. 1787.

Marks, 5–803.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0208 in 6 inches.
Estimated temperature, 594° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
5,000	10,000	.0009	.....	
10,000	20,000	.0031	.....	
15,000	30,000	.0047	.....	
18,000	36,000	.0058	.....	
19,000	38,000	.0064	.....	
20,000	40,000	.0068	.....	
21,000	42,000	.0072	.....	Elastic limit.
21,500	43,000	.0095	.....	
22,000	44,000	.0116	.....	
22,500	45,000	.0134	.....	
23,000	46,000	.0171	.....	
24,000	48,000	.0217	.....	
26,000	52,000	.0335	.....	
28,000	56,000	.0443	.....	
30,000	60,000	.0553	.....	
32,000	64,000	.0696	.....	
34,000	68,000	.0848	.....	
36,000	72,000	.0990	.....	
38,000	76,000	.1149	.....	
40,000	80,000	.1314	.....	
44,000	88,000	.17	.....	
48,000	96,000	.23	.....	
52,000	104,000	.345	.....	
53,000	106,000	.385	.....	
54,000	108,000	.455	.....	
55,000	110,000	.585	.....	
55,190	110,380	.705	.....	Tensile strength.
51,200	141,050	.....	.....	At time of fracture.
0	0	.94	.....	= 18.8 per cent.

Fractured 2″.25 from neck. Appearance, silky; oblique 45°. Brown-purple color. Surface of stem, blue and purple.

Local contraction, 1″ each side of fracture.

Diameter at fracture, ″.68. Area, .363 square inch. Contraction, 27.4 per cent.

Elongation of inch sections, ″.15, ″.29*, ″.26*, ″.14, ″.10.

No. 1883.

Marks, 5–803.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0255 in 6 inches.
Estimated temperature, 712° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
10,000	20,000	.0034	.....	
15,000	30,000	.0061	.....	
16,000	32,000	.0067	.....	
17,000	34,000	.0077	.....	Elastic limit.
18,000	36,000	.0094	.....	
19,000	38,000	.0115	.....	
20,000	40,000	.0141	.....	
22,000	44,000	.0212	.....	
24,000	48,000	.0303	.....	
26,000	52,000	.0421	.....	
28,000	56,000	.0544	.....	
30,000	60,000	.0696	.....	
32,000	64,000	.0842	.....	
34,000	68,000	.1019	.....	
36,000	72,000	.1216	.....	
38,000	76,000	.1445	.....	
40,000	80,000	.1690	.....	
42,000	84,000	.21	.....	
44,000	88,000	.24	.....	
45,000	90,000	.275	.....	
46,000	92,000	.33	.....	
46,890	93,780	.45	.....	Tensile strength.
32,600	136,970	.....	.....	At time of fracture.
0	0	.86	.....	= 17.2 per cent.

Fractured 2″.6 from neck. Appearance, silky; dark-blue color; cup shaped end. Surface of stem, dark blue, with purple hue.

Local contraction, ″.9 each side of fracture.

Diameter at fracture, ″.55. Area, .238 square inch. Contraction, 52.4 per cent.

Elongation of inch sections, ″.07, ″.18, ″.44*, ″.10, ″.07.

No. 1785.

Marks, 5–803.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0314 in 6 inches.
Estimated temperature, 861° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds	*Pounds.*	*Inch.*	*Inch.*	
1, 000	2, 000	0.	0.	Initial load.
10, 000	20, 000	.0029	.....	
11, 000	22, 000	.0034	.....	
12, 000	24, 000	.0036	.....	
13, 000	26, 000	.0043	.....	
14, 000	28, 000	.0047	.....	
15, 000	30, 000	.0053	.....	Elastic limit.
16, 000	32, 000	.0065	.....	
17, 000	34, 000	.0077	.....	
17, 500	35, 000	.0085	.....	
18, 000	36, 000	.0092	.....	
18, 500	37, 000	.0098	.....	
19, 000	38, 000	.0110	.....	
19, 500	39, 000	.0126	.....	
20, 000	40, 000	.0136	.....	
22, 000	44, 000	.0233	.....	
24, 000	48, 000	.0333	.....	
26, 000	52, 000	.0462	.....	
28, 000	56, 000	.0612	.....	
30, 000	60, 000	.0759	.....	
32, 000	64, 000	.105	.....	
34, 000	68, 000	.12	.....	
36, 000	72, 000	.15	.....	
38, 000	76, 000	.18	.....	
40, 000	80, 000	.215	.....	
41, 000	82, 000	.235	.....	
42, 000	84, 000	.255	.....	
43, 000	86, 000	.285	.....	
44, 000	88, 000	.34	.....	
44, 950	89, 900	.475	.....	Tensile strength.
29, 400	133, 030	.....	.....	At time of fracture.
0	0	.90	.....	=18.0 per cent.

Fractured 1″.40 from neck. Appearance, silky; dark-blue color. Cup-shaped ends.

Surface of stem, checkered blue-black color.

Local contraction, ″.9 each side of fracture.

Diameter at fracture, ″.53. Area, .221 square inch. Contraction, 55.8 per cent.

Elongation of inch sections, ″.43*, ″.24, ″.10, ″.08, ″.05.

No. 1884.

Marks, 5–803.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0414 in 6 inches.
Estimated temperature, 1113° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
10,000	20,000	.0041	.....	
11,000	22,000	.0049	.....	
12,000	24,000	.0059	.....	
13,000	26,000	.0069	.....	
14,000	28,000	.0082	.....	
15,000	30,000	.0095	.....	Elastic limit.
16,000	32,000	.0119	.....	
17,000	34,000	.0144	.....	
18,000	36,000	.0179	.....	
19,000	38,000	.0241	.....	
20,000	40,000	.0335	.....	
21,000	42,000	.0465	.....	
22,000	44,000	.0605	.....	
23,000	46,000	.0777	.....	
24,000	48,000	.0943	.....	
25,000	50,000	.1163	.....	
25,900	51,800	.1632	.....	
26,000	52,000	.1831	.....	
26,060	52,120	.2156 .46	.....	Tensile strength.
13,600	85,530	.....	.....	At time of fracture.
0	0	1.14	.....	=22.8 per cent.

Fractured 2″.80 from neck. Appearance, silky; dark-blue color. Surface of stem, dark blue.

Local contraction, 1″.2 each side of fracture.

Diameter at fracture, ″.45. Area, .159 square inch. Contraction, 68.2 per cent.

Elongation of inch sections, ″.07, ″.23, ″.68*, ″.11, ″.05.

No. 1786.

Marks, 5–803.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0496 in 6 inches.
Estimated temperature, 1319° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
2,000	4,000	.0006	.....	
3,000	6,000	.0011	.....	
3,500	7,000	.0016	.....	
4,000	8,000	.0020	.....	
4,500	9,000	.0025	.....	
5,000	10,000	.0029	.....	
5,500	11,000	.0034	.....	
6,000	12,000	.0043	.....	
6,500	13,000	.0050	.....	
7,000	14,000	.0054	.....	Elastic limit.
7,500	15,000	.0066	.....	
8,000	16,000	.0073	.....	
8,500	17,000	.0081	.....	
9,000	18,000	.0094	.....	
9,500	19,000	.0106	.....	
10,000	20,000	.0124	.....	
10,500	21,000	.0143	.....	
11,000	22,000	.0163	.....	
11,500	23,000	.0178	.....	
12,000	24,000	.0214	.....	
13,000	26,000	.0272	.....	
14,000	28,000	.0371	.....	
15,000	30,000	.0518	.....	
16,000	32,000	.0753	.....	
17,000	34,000	.1247	.....	Tensile strength,
0	0	.82	.....	= 16.4 per cent.

Fractured 1″ from neck. Appearance, silky. Cup-shaped ends, both ends concave. Triangular cavity near center of fracture ▲. Surface of fracture and stem, blue-black color.

Local contraction extends to the neck, and 1″.5 from fracture.

Diameter at fracture, ″.35. Area, .096 square inch. Contraction, 80.8 per cent.

Elongation of inch sections, ″.01, ″.02, ″.02, ″.08, ″.69*.

No. 1775.

Marks, 6–797.
Diameter, ″.798.
Sectional area, .50 square inch.
Temperature, 5° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
5,000	10,000	.0026	.....	
10,000	20,000	.0045	.....	
15,000	30,000	.0057	.....	
20,000	40,000	.0075	.....	
25,000	50,000	.0092	.....	
26,000	52,000	.0098	.....	
28,000	56,000	.0104	.....	
30,000	60,000	.0111	.....	
31,000	62,000	.0113 .0196	.....	Elastic limit.
Load fell.				
30,500	61,000	.0272	.....	
31,000	62,000	.0295	.....	
32,000	64,000	.0336	.....	
34,000	68,000	.0447	.....	
36,000	72,000	.0563	.....	
38,000	76,000	.0685	.....	
40,000	80,000	.0810	.....	
42,000	84,000	.0940	.....	
44,000	88,000	.1095	.....	
46,000	92,000	.1268	.....	
48,000	96,000	.14	.....	
50,000	100,000	.165	.....	
52,000	104,000	.19	.....	
54,000	108,000	.215	.....	
56,000	112,000	.25	.....	
57,000	114,000	.275	.....	
58,000	116,000	.30	.....	
59,000	118,000	.35	.....	
60,000	120,000	.43	.....	
60,560	121,120	.60	.....	Tensile strength.
58,600	143,280	.....	.....	At time of rupture.
0	0	.68	.....	= 13.6 per cent.

Fractured 2″.5 from neck. Appearance, granular, radiating from the center.

Fractured without appreciable local contraction.

Diameter at fracture, ″.72. Area, .407 square inch. Contraction, 18.6 per cent.

Elongation of inch sections, ″.09, ″.12, ″.20*, ″.17, ″.10.

No. 1812.

Marks, 6–797.
Diameter, ″.798.
Sectional area, .50 square inch.
Temperature, 70° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
5,000	10,000	.0014	.....	
10,000	20,000	.0031	.....	
15,000	30,000	.0046	.....	
20,000	40,000	.0064	.....	
25,000	50,000	.0082	.....	
26,000	52,000	.0085	.....	
27,000	54,000	.0089	.....	
27,500	55,000	.0091	.....	
28,000	56,000	.0093	.....	
28,500	57,000	.0094	.....	
29,000	58,000	.0097	.....	
29,500	59,000	.0098	.....	
30,000	60,000	.0100 .0264	.....	Elastic limit.
31,000	62,000	.0319	.....	
32,000	64,000	.0371	.....	
33,000	66,000	.0426	.....	
34,000	68,000	.0490	.....	
35,000	70,000	.0540	.....	
36,000	72,000	.0602	.....	
38,000	76,000	.0734	.....	
40,000	80,000	.0863	.....	
42,000	84,000	.1017	.....	
44,000	88,000	.1174	.....	
46,000	92,000	.1356	.....	
48,000	96,000	.1562	.....	
50,000	100,000	.18	.....	
52,000	104,000	.20	.....	
54,000	108,000	.24	.....	
56,000	112,000	.29	.....	
58,000	116,000	.40	.....	
58,960	117,920	.55	.....	Tensile strength.
57,600	145,450	.....	.....	At time of fracture.
0	0	.66	.....	=13.2 per cent.

Fractured 1″.50 from neck. Appearance, granular, radiating from a dull spot at the center.

Diameter at fracture, ″.71. Area, .396 square inch. Contraction, 20.8 per cent.

Elongation of inch sections, ″.11, ″.22*, ″.14, ″.11, ″.08.

No. 1789.

Marks, 6–797.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0055 in 6 inches.
Estimated temperature, 214° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
5,000	10,000	.0020	.....	
10,000	20,000	.0040	.....	
20,000	40,000	.0066	.....	
25,000	50,000	.0085	.....	
26,000	52,000	.0086	.....	
27,000	54,000	.0092	.....	
28,000	56,000	.0094	.....	
28,500	57,000	.0105	.....	Elastic limit.
	Load fell.			
28,000	56,000	.0162	.....	
		.0207	.....	
28,500	57,000	.0220	.....	
29,000	58,000	.0243	.....	
30,000	60,000	.0321	.....	
32,000	64,000	.0437	.....	
34,000	68,000	.0564	.....	
36,000	72,000	.0683	.....	
38,000	76,000	.0830	.....	
40,000	80,000	.0965	.....	
42,000	84,000	.1140	.....	
44,000	88,000	.1315	.....	
46,000	92,000	.1520	.....	
48,000	96,000	.17	.....	
50,000	100,000	.215	.....	
52,000	104,000	.25	.....	
53,000	106,000	.28	.....	
54,000	108,000	.315	.....	
55,000	110,000	.37	.....	
55,920	111,840	.55	.....	Tensile strength.
53,800	148,210	.....	.....	At time of fracture.
0	0	.67	.....	= 13.4 per cent.

Fractured 2″.25 from neck. Appearance, silky, with trace of granulation.

Local contraction, ″.8 each side of fracture.

Diameter at fracture, ″.68. Area, .363 square inch. Contraction, 27.4 per cent.

Elongation of inch sections, ″.07, ″.10, ″.17, ″.24*, ″.09.

No. 1899.

Marks, 6–797.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0063 in 6 inches.
Estimated temperature, 234° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
5,000	10,000	.0020	.....	
10,000	20,000	.0033	.....	
15,000	30,000	.0042	.....	
20,000	40,000	.0061	.....	
25,000	50,000	.0073	.....	
26,000	52,000	.0075	.....	
27,000	54,000	.0079	.....	
28,000	56,000	.0081	.....	
28,800	57,600	.....	.....	Elastic limit.
		Load fell.		
28,000	56,000	.0215	.....	
30,000	60,000	.0223	.....	
31,000	62,000	.0238	.....	
32,000	64,000	.0392	.....	
33,000	66,000	.0405	.....	
34,000	68,000	.0445	.....	
36,000	72,000	.0573	.....	
38,000	76,000	.0705	.....	
40,000	80,000	.0805	.....	
42,000	84,000	.1010	.....	
44,000	88,000	.1165	.....	
46,000	92,000	.1360	.....	
48,000	96,000	.1547	.....	
50,000	100,000	.1785	.....	
52,000	104,000	.2060	.....	
53,000	106,000	.2211	.....	
54,000	108,000	.2290	.....	
54,400	108,800	.....	.....	Tensile strength.
53,500	.....	.....	.....	Hot test discontinued.
0	0	.25	.....	= 5.0 per cent.

Elongation of inch sections, ″.05, ″.05, ″.05, ″.05, ″.05.
Minimum diameter, ″.78. Area, .478 square inch. Contraction, 4.4 per cent.
Surface of stem, straw colored.
Rested 24 hours, and observations then made at temperature of 70° Fahr.
Gauged length, 5″.25.
Mean sectional area, .476 square inch.

No. 1899—Continued.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
500	.....	0.	0.	Initial load.
1,000	.....	.0002	.....	E = 27,550,000 pounds between 5,000 and 40,000 pounds.
5,000	.....	.0018	.....	
10,000	.....	.0038	.....	
15,000	.....	.0057	.....	
20,000	.....	.0077	.....	
25,000	.....	.0096	.....	
30,000	.....	.0116	.....	
35,000	.....	.0136	.....	
40,000	.....	.0158	.....	
45,000	.....	.0183	.0002	
50,000	.....	.0220	.0006	
Test completed after a further rest of 40 hours.				
56,000	.....	.....	.....	Elastic limit.
	112,000	.....	.....	On original area.
	117,150	.....	.....	On reduced area.
57,000	.....	.03	.....	
58,000	.....	.04	.....	
59,000	.....	.06	.....	
60,000	.....	.25	.....	Tensile strength.
	120,000	.....	.....	On original area.
	125,520	.....	.....	On reduced area.
58,100	142,750	.....	.....	At time of fracture.
0	0	.58	.....	= 11.6 per cent. total elongation.

Fractured 1″.10 from neck. Appearance, fine granular; small dull spot at the center.

Local contraction, ″.9 each side of fracture.

Diameter at fracture, ″.72. Area, .407 square inch. Contraction, 18.6 per cent.

Elongation of inch sections, ″.08, ″.10, ″.10, ″.14, ″.16*.

No. 1888.

Marks, 6–797.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0094 in 6 inches.
Estimated temperature, 315° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
5,000	10,000	.0020	.....	
10,000	20,000	.0032	.....	
15,000	30,000	.0041	.....	
20,000	40,000	.0057	.....	
25,000	50,000	.0068	.....	
26,000	52,000	.0070	.....	
27,000	54,000	.0075	.....	
28,000	56,000	.0076	.....	
28,800	57,600	.....	.....	Elastic limit.
		Load fell.		
28,000	56,000	.0183	.....	
31,000	62,000	.0186	.....	Throbs.
31,500	63,000	.0220	.....	
32,000	64,000	.0221	.....	
33,000	66,000	.0322	.....	
34,000	68,000	.0343	.....	
35,000	70,000	.0349	.....	
36,000	72,000	.0367	.....	
37,000	74,000	.0416	.....	
		.0458	.....	
38,000	76,000	.0509	.....	
39,000	78,000	.0553	.....	
40,000	80,000	.0582	.....	
41,000	82,000	.0679	.....	
43,000	86,000	.0747	.....	
44,000	88,000	.0911	.....	Violent throbs during the remainder of test.
46,000	92,000	.0912	.....	
47,000	94,000	.0993	.....	
48,000	96,000	.1016	.....	
49,000	98,000	.1090	.....	
50,000	100,000	.1122	.....	
51,000	102,000	.135	.....	
52,000	104,000	.16	.....	
54,000	108,000	.19	.....	
57,000	114,000	.215	.....	
		.26	.....	
58,000	116,000	.275	.....	
59,000	118,000	.285	.....	
59,500	119,000	.335	.....	Tensile strength.
58,800	144,470	.....	.....	At time of fracture.
0	0	.38	.....	= 7.6 per cent.

Fractured 1″.20 from neck. Appearance, silky center 50 per cent.; granular at circumference 50 per cent. No change in color. Surface of stem, pale straw colored.

Local contraction, ″.50 each side of fracture.

Diameter at fracture, ″.72. Area, .407 square inch. Contraction, 3.6 per cent.

Elongation of inch sections, ″.05, ″.04, ″.06, ″.13*, ″.10.

No. 1890.

Marks, 6–797.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0104 in 6 inches.
Estimated temperature, 342° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
5,000	10,000	.0012	.....	
10,000	20,000	.0024	.....	
15,000	30,000	.0032	.....	
20,000	40,000	.0046	.....	
25,000	50,000	.0060	.....	
26,000	52,000	.0062	.....	
27,000	54,000	.0067	.....	
28,000	56,000	.0069	.....	
28,600	57,200	.....	.....	Elastic limit.
	Load fell.			
28,000	56,000	.0165	.....	
30,000	60,000	.0172	.....	
32,000	64,000	.0278	.....	Throbs.
34,000	68,000	.0323	.....	
36,000	72,000	.0370	.....	
38,000	76,000	.0532	.....	
40,000	80,000	.0541	.....	
42,000	84,000	.0601	.....	Violent throbs.
44,000	88,000	.0887	.....	
46,000	92,000	.0909	.....	
48,000	96,000	.1126	.....	
50,000	100,000	.1346	.....	
54,000	108,000	.1581	.....	
58,000	116,000	.195	.....	
59,000	118,000	.30	.....	
59,200	118,400	.....	.....	Tensile strength.
0	0	.37	.....	=7.4 per cent.

Fractured ″.75 from neck. Appearance, silky; trace of granulation. Fractured suddenly. Cup-shaped end.

Local contraction, ″.75 each side of fracture.

Diameter at fracture, ″.71. Area, .396 square inch. Contraction, 20.8 per cent.

Elongation of inch sections, ″.05, ″.05, ″.06, ″.07, ″.14*.

No. 1891.

Marks, 6–797.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0116 in 6 inches.
Estimated temperature, 373° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
5,000	10,000	.0011	.....	
10,000	20,000	.0022	.....	
15,000	30,000	.0030	.....	
20,000	40,000	.0041	.....	
25,000	50,000	.0054	.....	
26,000	52,000	.0056	.....	
27,000	54,000	.0061	.....	
28,000	56,000	.0064	.....	
28,600	57,200	.0108	.....	Elastic limit.
29,000	58,000	.0119	.....	
30,000	60,000	.0197	.....	
31,000	62,000	.0199	.....	Throbs.
32,000	64,000	.0220	.....	
33,000	66,000	.0247	.....	
34,000	68,000	.0368	.....	
36,000	72,000	.0389	.....	
38,000	76,000	.0489	.....	
40,000	80,000	.0556	.....	
42,000	84,000	.0676	.....	
44,000	88,000	.0823	.....	
46,000	92,000	.0934	.....	
48,000	96,000	.1011	.....	Violent throbs.
50,000	100,000	.1206	.....	
52,000	104,000	.1256	.....	
53,000	106,000	.1367	.....	
54,000	108,000	.1386	.....	
55,800	111,600	.....	.....	Hot test discontinued, the bar undergoing violent throbs at the time.
0	0	.15	.....	=3.0 per cent.

Elongation of inch sections, ″.03, ″.03, ″.03, ″.03, ″.03.
Minimum diameter, ″.785. Area, .484 square inch. Contraction, 3.2 per cent.
Surface of stem, pale straw color.
Rested 68 hours and then test completed at temperature of 70° Fahr.
Gauged length, 5″.15.
Mean sectional area, .485 square inch.

No. 1891—Continued.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
500	.....	0.	0.	Initial load.
1,000	.....	.0002	.....	
5,000	.....	.0016	.....	
10,000	.....	.0035	.....	
15,000	.....	.0053	.....	
20,000	.....	.0071	.....	E = 28,610,000 pounds between 5,000 and 50,000 pounds.
25,000	.....	.0089	.....	
30,000	.....	.0108	0.	
35,000	.....	.0126	.....	
40,000	.....	.0145	.....	
45,000	.....	.0163	.....	
50,000	.....	.0183	0.	
59,100	.....	.....	.....	Elastic limit—rapid stretching began.
	118,200	.....	.....	On original area.
	122,110	.....	.....	On reduced area.
60,000	.....	.10	.....	
61,000	.....	.15	.....	Feeble throbs.
61,550	.....	.83	.....	Tensile strength.
	123,100	.....	.....	On original area.
	127,170	.....	.....	On reduced area.
58,900	146,520	.....	.....	At time of fracture.
0	0	.50	.....	=10.0 per cent. total elongation.

Fractured 1″.85 from neck. Appearance, fine granular; small dull spot at the center.

Local contraction, ″.8 each side of fracture.

Diameter at fracture, ″.715. Area, .402 square inch. Contraction, 19.6 per cent.

Elongation of inch sections, ″.07, ″.07, ″.08, ″.20*, ″.08.

No. 1793.

Marks, 6–797.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0135 in 6 inches.
Estimated temperature, 422° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
5,000	10,000	.0012	.....	
10,000	20,000	.0031	.....	
15,000	30,000	.0042	.....	
20,000	40,000	.0065	.....	
24,000	48,000	.0082	.....	
24,500	49,000	.0084	.....	
25,000	50,000	.0086	.....	
25,500	51,000	.0088	.....	Elastic limit.
26,000	52,000	.0094	.....	
26,500	53,000	.0102	.....	
27,000	54,000	.0115	.....	
27,500	55,000	.0131	.....	
28,000	56,000	.0143	.....	
29,000	58,000	.0177	.....	
30,000	60,000	.0191	.....	
32,000	64,000	.0269	.....	
34,000	68,000	.0345	.....	
36,000	72,000	.0419	.....	
38,000	76,000	.0501	.....	
40,000	80,000	.0581	.....	
42,000	84,000	.0678	.....	
44,000	88,000	.0783	.....	
46,000	92,000	.0896	.....	
48,000	96,000	.1022	.....	
50,000	100,000	.1136	.....	
52,000	104,000	.1258	.....	
54,000	108,000	.1413	.....	
56,000	112,000	.1575	.....	
58,000	116,000	.175	.....	
60,000	120,000	.215	.....	
61,000	122,000	.235	.....	
62,000	124,000	.265	.....	
63,000	126,000	.30	.....	
64,000	128,000	.35	.....	
64,120	128 240	.38	.....	Tensile strength.
63,800	152,270	.....	.....	At time of fracture.
0	0	.40	.....	= 8.0 per cent.

Fractured ″.75 from neck. Appearance, silky; cup-shaped ends. Fracture and surface of stem, straw colored.

Local contraction, ″.8 one side, and to the neck on other side of fracture.

Diameter at fracture, ″.73. Area, .419 square inch. Contraction, 16.2 per cent.

Elongation of inch sections, ″.06, ″.07, ″.07, ″.07, ″.13*.

No. 1889.

Marks, 6–797.
Diameter, ″.798. Sectional area, 50 square inch.
Expansion, ″.0180 in 6 inches. Estimated temperature, 540° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
5,000	10,000	.0017	.....	
10,000	20,000	.0039	.....	
15,000	30,000	.0059	.....	
20,000	40,000	.0083	.....	
21,000	42,000	.0086	.....	
22,000	44,000	.0094	.....	
23,000	46,000	.0100	.....	Elastic limit.
24,000	48,000	.0113	.....	
25,000	50,000	.0128	.....	
26,000	52,000	.0148	.....	
27,000	54,000	.0176	.....	
28,000	56,000	.0204	.....	
29,000	58,000	.0240	.....	
30,000	60,000	.0274	.....	
32,000	64,000	.0338	.....	
34,000	68,000	.0420	.....	
36,000	72,000	.0502	.....	
38,000	76,000	.0598	.....	
40,000	80,000	.0703	.....	
44,000	88,000	.0925	.....	
48,000	96,000	.1176	.....	
52,000	104,000	.1488	.....	
56,000	112,000	.1833	.....	
60,000	120,000	.2438	.....	
61,000	122,000	.2688	.....	
62,000	124,000	.2943	.....	
63,000	126,000	.345	.....	
64,000	128,000	.39	.....	
65,000	130,000	.44	.....	
65,300	130,600	.54	.....	Tensile strength.
66,000	.....	.....	.....	Test discontinued.
0	0	.60	.....	=12.0 per cent.

Elongation of inch sections, ″.10, ″.13, ″.14, ″.12, ″.11.
Minimum diameter, ″.749. Area, .441 sq. in. Contraction, 11.8 per ct.
Surface of stem, dark purple. Bar rested 70 hours, and the test then completed at temperature of 70° Fahr.
Gauged length, 5″.60. Mean sectional area, .446 square inch.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
500	.....	0.	0.	Initial load.
1,000	.....	.0003	.....	
5,000	.....	.0020	.....	
10,000	.....	.0041	.....	
15,000	.....	.0062	.....	
20,000	.....	.0085	.....	E =28,970,000 lbs. between 5,000 and 50,000 lbs.
25,000	.....	.0106	.....	
30,000	.....	.0128	.0002	
35,000	.....	.0151	.....	
40,000	.....	.0173	.....	
45,000	.....	.0195	.....	
50,000	.....	.0217	.0002	
74,890	.....	.....	.....	Tensile strength.
	149,780	.....	.....	On original area.
	169,820	.....	.....	On reduced area.
.....	.....	.....	.....	Fractured suddenly under the maximum
0	0	.62	.....	=12.4 per cent. total elongation.

Fractured 2″.35 from neck. Appearance, fine granular.
Local contraction not appreciable.
Diameter at fracture, ″.745. Area, .436 square inch. Contraction, 12.8 per cent. Elongation of inch sections, ″.10, ″.13, ″.15*, ″.12, ″.11.

No. 1790.

Marks, 6–797.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0198 in 6 inches.
Estimated temperature, 587° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
5,000	10,000	.0017	.....	
10,000	20,000	.0039	.....	
15,000	30,000	.0051	.....	
20,000	40,000	.0075	.....	
22,000	44,000	.0091	.....	
22,500	45,000	.0093	.....	
23,000	46,000	.0097	.....	Elastic limit.
23,500	47,000	.0106	.....	
24,000	48,000	.0113	.....	
25,000	50,000	.0122	.....	
26,000	52,000	.0151	.....	
27,000	54,000	.0176	.....	
28,000	56,000	.0204	.....	
29,000	58,000	.0235	.....	
30,000	60,000	.0260	.....	
32,000	64,000	.0341	.....	
34,000	68,000	.0421	.....	
36,000	72,000	.0502	.....	
38,000	76,000	.0602	.....	
40,000	80,000	.0696	.....	
42,000	84,000	.0809	.....	
44,000	88,000	.0927	.....	
46,000	92,000	.1055	.....	
48,000	96,000	.1187	.....	
50,000	100,000	.1327	.....	
52,000	104,000	.1467	.....	
54,000	108,000	.17	.....	
56,000	112,000	.18	.....	
58,000	116,000	.20	.....	
60,000	120,000	.245	.....	
62,000	124,000	.28	.....	
63,000	126,000	.32	.....	
64,000	128,000	.36	.....	
65,000	130,000	.40	.....	
66,000	132,000	.47	.....	
66,520	133,040	.63	.....	Tensile strength.
64,800	154,650	.....	.....	At time of fracture.
0	0	.69	.....	=13.8 per cent.

Fractured 2″.65 from neck. Appearance, silky; oblique 47°; purple-brown color. Surface of stem, brown with irregular shaped blue spots. Fractured without appreciable local contraction.

Diameter at fracture, ″.73. Area, .419 square inch. Contraction, 16.2 per cent.

Elongation of inch sections, ″.10, ″.18*, ″.19*, ″.13, ″.09.

No. 1794.

Marks, 6–797.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0232 in 6 inches.
Estimated temperature, 676° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
5,000	10,000	.0019	.....	
10,000	20,000	.0042	.....	
15,000	30,000	.0058	.....	
20,000	40,000	.0085	.....	
23,000	46,000	.0120	.....	
23,500	47,000	.0127	.....	
24,000	48,000	.0135	.....	
24,500	49,000	.0145	.....	
25,000	50,000	.0155	.....	
25,500	51,000	.0163	.....	Elastic limit.
26,000	52,000	.0176	.....	
26,500	53,000	.0190	.....	
27,000	54,000	.0205	.....	
28,000	56,000	.0237	.....	
29,000	58,000	.0275	.....	
30,000	60,000	.0306	.....	
32,000	64,000	.0382	.....	
34,000	68,000	.0469	.....	
36,000	72,000	.0583	.....	
38,000	76,000	.0697	.....	
40,000	80,000	.0800	.....	
42,000	84,000	.0915	.....	
44,000	88,000	.1050	.....	
46,000	92,000	.1186	.....	
48,000	96,000	.1355	.....	
50,000	100,000	.1535	.....	
52,000	104,000	.1742	.....	
54,000	108,000	.20	.....	
55,000	110,000	.22	.....	
56,000	112,000	.24	.....	
57,000	114,000	.255	.....	
58,000	116,000	.275	.....	
59,000	118,000	.31	.....	
60,000	120,000	.37	.....	
60,600	121,200	.48	.....	Tensile strength.
50,200	155,900	.....	.....	At time of fracture.
0	0	.82	.....	= 16.4 per cent.

Fractured 2″.50 from neck. Appearance, silky; dark-blue color. Surface of stem, blue black with greenish tinge, and purple in the vicinity of fracture.

Local contraction, 1″ each side of fracture.

Diameter at fracture, ″.64. Area, .322 square inch. Contraction, 35.6 per cent.

Elongation of inch sections, ″.07, ″.12, ″.34*, ″.20, ″.09.

No. 1885.

Marks, 6–797.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0280 in 6 inches.
Estimated temperature, 801° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
15,090	30,000	.0041	.....	
18,000	36,000	.0057	.....	
19,000	38,000	.0064	.....	
20,000	40,000	.0070	.....	
21,000	42,000	.0078	.....	
22,000	44,000	.0088	.....	
23,000	46 000	.0098	.....	Elastic limit.
24,000	48,000	.0119	.....	
25,000	50,000	.0138	.....	
26,000	52,000	.0165	.....	
27,000	54,000	.0194	.....	
28,000	56,000	.0229	.....	
30,000	60,000	.0308	.....	
32,000	64,000	.0404	.....	
34,000	68,000	.0494	.....	
36,000	72,000	.0600	.....	
38,000	76,000	.0717	.....	
40,000	80,000	.0847	.....	
42,000	84,000	.0992	.....	
44,000	88,000	.1177	.....	
46,000	92,000	.1373	.....	
48,000	96,000	.165	.....	
50,000	100,000	.195	.....	
51,000	102,000	.205	.....	
52,920	105,840	.345	.....	Tensile strength.
40,600	139,040	.....	.....	At time of fracture.
0	0	.67	.....	= 13.4 per cent.

Fractured 2″.75 from neck. Appearance, silky; dark blue; cup-shaped. Surface of stem, dark blue, checkered.

Local contraction, ″.9 each side of fracture.

Diameter at fracture, ″.61. Area, .292 square inch. Contraction, 41.6 per cent.

Elongation of inch sections, ″.04, ″.08, ″.38*, ″.10, ″.04.

No. 1892.

Marks, 6–797.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0297 in 6 inches.
Estimated temperature, 845° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
5,000	10,000	.0010	.....	
10,000	20,000	.0033	.....	
15,000	30,000	.0050	.....	
20,000	40,000	.0081	.....	
21,000	42,000	.0092	.....	
22,000	44,000	.0095	.....	Elastic limit.
23,000	46,000	.0115	.....	
24,000	48,000	.0135	.....	
25,000	50,000	.0161	.....	
26,000	52,000	.0180	.....	
28,000	56,000	.0248	.....	
30,000	60,000	.0328	.....	
32,000	64,000	.0420	.....	
34,000	68,000	.0518	.....	
36,000	72,000	.0639	.....	
38,000	76,000	.0771	.....	
40,000	80,000	.0921	.....	
42,000	84,000	.1060	.....	
44,000	88,000	.1271	.....	
46,000	92,000	.1504	.....	
48,000	96,000	.1883	.....	
50,000	100,000	.2491	.....	
50,800	101,200	.3028	.....	
50,660	101,320	.....	.....	Tensile strength.
Hot test discontinued.				
0	0	.35	.....	=7.0 per cent.

Elongation of inch sections, ″.06, ″.08, ″.08, ″.07, ′ 06.
Minimum diameter, ″.770. Area, .466 square inch. Contraction, 6.8 per cent.
Surface of stem, blue black.
Rested 68 hours, and test then completed at temperature of 70° Fahr.
Gauged length, 5″.35.
Mean sectional area, .467 square inch.

No. 1892—Continued.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
500	0.	0.	.....	Initial load.
1,000	.....	.0002	.....	
5,000	.....	.0019	.....	
10,000	.....	.0038	.....	
15,000	.....	.0058	.....	
20,000	.....	.0078	.....	E = 29,720,000 pounds between 5,000 and 50,000 pounds.
25,000	.....	.0098	0.	
30,000	.....	.0116	.....	
35,000	.....	.0136	.....	
40,000	.....	.0154	.....	
42,000	.....	.0162	.....	
44,000	.....	.0171	.....	
46,000	.....	.0178	.....	
48,000	.....	.0186	.....	
50,000	.....	.0193	0.	
61,900	.....	.07	.....	Elastic limit.
	123,800	.....	.....	On original area.
	132,830	.....	.....	On reduced area.
62,200	.....	.....	.....	Tensile strength.
	124,400	.....	.....	On original area.
	133,480	.....	.....	On reduced area.
Fractured suddenly under the maximum load.				
0	0	.38	.....	= 7.6 per cent. total elongation.

Fractured ″.33 from neck. Appearance, fine granular.
Local contraction not appreciable.
Diameter at fracture, ″.770. Area, .466 square inch. Contraction, 6.8 per cent.
Elongation of inch sections, ″.06, ″.08, ″.08, ″.07, ″.09*.

No. 1792.

Marks, 6–797.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0338 in 6 inches.
Estimated temperature, 953° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
5,000	10,000	.0018	.....	
10,000	20,000	.0047	.....	
15,000	30,000	.0070	.....	
20,000	40,000	.0118	.....	
20,500	41,000	.0125	.....	
21,000	42,000	.0132	.....	
21,500	43,000	.0139	.....	Elastic limit.
22,000	44,000	.0148	.....	
23,000	46,000	.0174	.....	
23,500	47,000	.0187	.....	
24,000	48,000	.0205	.....	
25,000	50,000	.0235	.....	
26,000	52,000	.0276	.....	
27,000	54,000	.0331	.....	
28,000	56,000	.0374	.....	
29,000	58,000	.0440	.....	
30,000	60,000	.0503	.....	
32,000	64,000	.0621	.....	
34,000	68,000	.0764	.....	
36,000	72,000	.0940	.....	
38,000	76,000	.1137	.....	
40,000	80,000	.1402	.....	
42,000	84,000	.1727	.....	
43,000	86,000	.21	.....	
44,000	88,000	.235	.....	
45,000	90,000	.285	.....	
45,400	90,800	.37	.....	Tensile strength.
39,200	148,480	.....	.....	At time of fracture.
0	0	.78	.....	=15.6 per cent.

Fractured 2″.50 from neck. Appearance, silky; blue black color. Surface of stem same color.

Local contraction, 1″ each side of fracture.

Diameter at fracture, ″.58. Area, .264 square inch. Contraction, 47.2 per cent.

Elongation of inch sections, ″.07, ″.26*, ″.34*, ″.08, ″.03.

No. 1894.

Marks, 6–797.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0345 in 6 inches.
Estimated temperature, 971° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
5,000	10,000	.0029	.....	
10,000	20,000	.0053	.....	
15,000	30,000	.0071	.....	
16,000	32,000	.0077	.....	
17,000	34,000	.0084	.....	
18,000	36,000	.0093	.....	
19,000	38,000	.0100	.....	
20,000	40,000	.0111	.....	Elastic limit.
21,000	42,000	.0126	.....	
22,000	44,000	.0143	.....	
23,000	46,000	.0162	.....	
24,000	48,000	.0192	.....	
25,000	50,000	.0235	.....	
26,000	52,000	.0278	.....	
27,000	54,000	.0325	.....	
28,000	56,000	.0382	.....	
29,000	58,000	.0448	.....	
30,000	60,000	.0496	.....	
32,000	64,000	.0632	.....	
34,000	68,000	.0787	.....	
36,000	72,000	.0986	.....	
38,000	76,000	.1220	.....	
40,000	80,000	.1555	.....	
41,000	82,000	.1825	.....	
42,000	84,000	.2390	.....	
42,060	84,120	.265	.....	Tensile strength.
41,800	.....	.....	.....	Hot test discontinued.
0	0	.30	.....	=6.0 per cent.

Elongation of inch sections, ″.05, ″.07, ″.07, ″.07, ″.04.
Minimum diameter, ″.769. Area, .464 square inch. Contraction, 7.2 per cent.
Rested 48 hours, and then observations made at temperature of 70° Fahr.
Surface of stem, dark blue.
Gauged length, 5″.30.
Mean sectional area, .472 square inch.

No. 1894—Continued.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
500	.....	0.	0.	Initial load.
1,000	.....	.0001	.....	
5,000	.....	.0017	.....	
10,000	.....	.0036	.....	E = 28,700,000 pounds between 5,000 and 50,000 pounds.
15,000	.....	.0056	.....	
20,000	.....	.0076	.....	
25,000	.....	.0095	.....	
30,000	.....	.0115	.....	
35,000	.....	.0134	.....	
40,000	.....	.0153	0.	
45,000	.....	.0172	.....	
50,000	.....	.0193	0.	
Test completed after rest of 40 hours.				
53,100	.....	.....	.....	Elastic limit.
	106,200	.....	.....	On original area.
	114,440	.....	.....	On reduced area.
54,000	.....	.06	.....	
55,000	.....	.075	.....	
56,000	.....	.09	.....	
57,000	.....	.10	.....	
58,000	.....	.12	.....	
59,000	.....	.15	.....	
60,000	.....	.19	.....	
60,600	.....	.....	.....	Tensile strength.
	121,200	.....	.....	On original area.
	130,600	.....	.....	On reduced area.
.....	.....	.....	.....	Fractured under the maximum load.
0	0	.49	.....	= 9.8 per cent. total elongation.

Fractured 1″.06 from neck. Appearance, fine granular.

Local contraction not appreciable.

Diameter at fracture, ″.76. Area, .454 square inch. Contraction, 9.2 per cent.

Diameter 3″ from neck, ″.75.

Elongation of inch sections, ″.06, ″.09, ″.12, ″.12, ″.10*.

No. 1886.

Marks, 6–797.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0386 in 6 inches.
Estimated temperature, 1008° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
5,000	10,000	.0016	.....	
10,000	20,000	.0042	.....	
15,000	30,000	.0072	.....	
16,000	32,000	.0085	.....	
17,000	34,000	.0092	.....	Elastic limit.
18,000	36,000	.0106	.....	
19,000	38,000	.0120	.....	
20,000	40,000	.0144	.....	
21,000	42,000	.0177	.....	
22,000	44,000	.0224	.....	
23,000	46,000	.0278	.....	
24,000	48,000	.0342	.....	
26,000	52,000	.0464	.....	
28,000	56,000	.0648	.....	
30,000	60,000	.0907	.....	
32,000	64,000	.1423	.....	
33,670	67,340	.25	.....	Tensile strength.
18,600	81,220	.....	.....	At time of fracture.
0	0	.88	.....	= 17.6 per cent.

Fractured 2″.40 from neck. Appearance, silky. Surface of fracture and stem, blue-black color,

Local contraction, 1″.2 each side of fracture.

Diameter at fracture, ″.54. Area, .229 square inch. Contraction, 54.2 per cent.

Elongation of inch sections, ″.05, ″.36*, ″.38*, ″.07, ″.02.

No. 1895.

Marks, 6–797.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0382 in 6 inches.
Estimated temperature, 1067° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
5,000	10,000	.0015	.....	
10,000	20,000	.0047	.....	
11,000	22,000	.0053	.....	
12,000	24,000	.0058	.....	
13,000	26,000	.0064	.....	
14,000	28,000	.0071	.....	
15,000	30,000	.0079	.....	
16,000	32,000	.0086	.....	Elastic limit (not well defined).
17,000	34,000	.0099	.....	
18,000	36,000	.0111	.....	
19,000	38,000	.0126	.....	
20,000	40,000	.0146	.....	
21,000	42,000	.0171	.....	
22,000	44,000	.0206	.....	
23,000	46,000	.0244	.....	
24,000	48,000	.0305	.....	
25,000	50,000	.0371	.....	
26,000	52,000	.0450	.....	
27,000	54,000	.0544	.....	
28,000	56,000	.0659	.....	
29,000	58,000	.0745	.....	
30,000	60,000	.0849	.....	
31,000	62,000	.0946	.....	
32,000	64,000	.1204	.....	
33,000	66,000	.1428	.....	
34,000	68,000	.1904	.....	
34,380	68,760	.2354	.....	Tensile strength.
34,000	.....	.....	.....	Hot test discontinued.
0	0	.27	.....	=5.4 per cent.

Elongation of inch sections, ″.03, ″.06, ″.08, ″.06, ″.04.
Minimum diameter, ″.768. Area, .463 square inch. Contraction, 7.4 per cent.
Surface of stem, blue black.
Rested 44 hours, and then observations made at temperature of 70° Fahr.
Gauged length, 5″.27.
Mean sectional area, .474 square inch.

No. 1895—Continued.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
500	.....	0.	0.	Initial load.
1,000	.....	.0001	.....	
5,000	.....	.0016	.....	
10,000	.....	.0036	.....	E=28,960,000 pounds between 5,000 pounds and 30,000 pounds.
15,000	.....	.0056	.....	
20,000	.....	.0074	.....	
25,000	.....	.0095	.....	
30,000	.....	.0113	.0001	
35,000	.....	.0132	.....	
40,000	.....	.0151	.....	
43,000	.....	.0164	.....	
44,000	.....	.0169	.....	Elastic limit.
	83,000	.....	.....	On original area.
	95,030	.....	.....	On reduced area.
45,000	.....	.0248	.....	
46,000	.....	.0465	.....	
48,000	.....	.06	.....	
50,000	.....	.08	.....	
Test completed after a further rest of 40 hours.				
52,000	.....	.10	.....	
54,000	.....	.12	.....	
56,000	.....	.14	.....	
58,000	.....	.23	.....	
58,560	.....	.30	.....	Tensile strength.
	117,120	.....	.....	On original area.
	126,480	.....	.....	On reduced area.
57,000	148,050	.....	.....	At time of fracture.
0	0	.61	.....	=12.2 per cent. total elongation.

Fractured 2″.8 from neck. Appearance, fine granular; small dull spot at the center.

Local contraction, ″.8 each side of fracture.

Diameter at fracture, ″.70. Area, .385 square inch. Contraction, 23.0 per cent.

Elongation of inch sections, ″.07, ″.11, ″.23*, ″.13, ″.07.

No. 1893.

Marks, 6–797.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0441 in 6 inches.
Estimated temperature, 1221° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
5,000	10,000	.0036	.....	
10,000	20,000	.0068	.....	
11,000	22,000	.0076	.....	
12,000	24,000	.0087	.....	
13,000	26,000	.0100	.....	
14,000	28,000	.0113	.....	Elastic limit (not well defined).
15,000	30,000	.0141	.....	
16,000	32,000	.0183	.....	
17,000	34,000	.0223	.....	
18,000	36,000	.0283	.....	
19,000	38,000	.0381	.....	
20,000	40,000	.0498	.....	
21,000	42,000	.0618	.....	
22,000	44,000	.0773	.....	
23,000	46,000	.0877	.....	
24,000	48,000	.1246	.....	
24,250	48,500	.1676	.....	Tensile strength.
24,000	.....	.....	.....	Hot test discontinued.
0	0	.22	.....	=4.4 per cent.

Elongation of inch sections, ″.02, ″.04, ″.07, ″.06, ″.03.
Minimum diameter, ″.775. Area, .472 square inch. Contraction 5.6 per cent.
Rested 48 hours, and then micrometer observations taken at temperature of 70° Fahr.
Surface of stem, blue black.
Gauged length, 5″.22.
Mean sectional area, .479 square inch.

No. 1893—Continued.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
500	.....	0.	0.	Initial load.
1,000	.....	.0001	.....	
5,000	.....	.0016	.....	
10,000	.....	.0035	.....	E = 29,220,000 pounds between 5,000 and 35,000 pounds.
15,000	.....	.0054	.....	
20,000	.....	.0072	0.	
25,000	.....	.0090	.....	
30,000	.....	.0109	0.	
35,000	.....	.0128	.....	
37,000	.....	.0136	.....	
38,000	.....	.0141	.....	Elastic limit.
	76,000	.....	.....	On original area.
	80,510	.....	.....	On reduced area.
39,000	.....	.0280	.....	
40,000	.....	.03	.....	
41,000	.....	.035	.....	
42,000	.....	.05	.....	
44,000	.....	.07	.....	
46,000	.....	.08	.....	
48,000	.....	.11	.....	
50,000	.....	.18	.....	
Test completed after a further rest of 40 hours.				
52,000	.....	.14	.....	
54,000	.....	.18	.....	
56,000	.....	.25	.....	
57,580	.....	.40	.....	Tensile strength.
	115,160	.....	.....	On original area.
	121,990	.....	.....	On reduced area.
57,500	149,350	.....	.....	At time of rupture.
0	0	.67	.....	= 13.4 per cent. total elongation.

Fractured 2″.5 from neck. Appearance, fine granular; small dull spot at the center.

Local contraction, ″.8 each side of fracture.

Diameter at fracture, ″.70. Area, .385 square inch. Contraction, 23.0 per cent.

Elongation of inch sections, ″.07, ″.11, ″.23*, ″.17, ″.09.

No. 1887.

Marks, 6–797.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0461 in 6 inches.
Estimated temperature, 1274° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
5,000	10,000	.0029	.....	
6,000	12,000	.0042	.....	
7,000	14,000	.0050	.....	
8,000	16,000	.0062	.....	
9,000	18,000	.0074	.....	
10,000	20,000	.0086	.....	Elastic limit.
11,000	22,000	.0104	.....	
12,000	24,000	.0127	.....	
13,000	26,000	.0155	.....	
14,000	28,000	.0194	.....	
15,000	30,000	.0268	.....	
16,000	32,000	.0353	.....	
17,000	34,000	.0450	.....	
18,000	36,000	.0611	.....	
19,000	38,000	.0972	.....	
19,520	39,040	.20	.....	Tensile strength.
0	0	.75	.....	= 15.0 per cent.

Fractured 2″.50 from neck. Appearance, silky; blue-black color. Surface of stem, blue black.

Local contraction, 1″.2 each side of fracture.

Diameter at fracture, ″.42. Area, .139 square inch. Contraction, 72.2 per cent.

Elongation of inch sections, ″.02, ″.49*, ″.22, ″.02, ″.00.

No. 1896.

Marks, 6–797.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0502 in 6 inches.
Estimated temperature, 1380° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
2,000	4,000	.0012	.....	
3,000	6,000	.0034	.....	
4,000	8,000	.0045	.....	
5,000	10,000	.0055	.....	
6,000	12,000	.0065	.....	
7,000	14,000	.0081	.....	
8,000	16,000	.0096	.....	Elastic limit (not well defined).
9,000	18,000	.0124	.....	
10,000	20,000	.0172	.....	
11,000	22,000	.0219	.....	
12,000	24,000	.0287	.....	
13,000	26,000	.0419	.....	
14,000	28,000	.0587	.....	
15,000	30,000	.1020	.....	
15,100	30,200	.1275	.....	Tensile strength.
14,800	.....	.....	.....	Hot test discontinued.
0	0	.17	.....	= 3.4 per cent.

Elongation of inch sections, ″.02, ″.03, ″.05, ″.05, ″.02.
Minimum diameter, ″.780. Area, .478 square inch. Contraction, 4.4 per cent.
Surface of stem, blue black.
Rested 24 hours, and observations then made at temperature of 70°.
Gauged length, 5″.17.
Mean sectional area, .484 square inch.

No. 1896—Continued.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
500	.....	0.	0.	Initial load.
1,000	.....	.0002	.....	
5,000	.....	.0017	.....	E=29,290,000 pounds between 5,000 and 25,000 pounds.
10,000	.....	.0034	.....	
15,000	.....	.0054	.....	
20,000	.....	.0073	.....	
25,000	.....	.0090	.....	
30,000	.....	.0110	.....	
31,000	.....	.0114	.....	
32,000	.....	.0119	.....	Elastic limit.
	64,000	.....	.....	On original area.
	66,950	.....	.....	On reduced area.
33,000	.....	.0381	.....	
34,000	.....	.0445	.....	
36,000	.....	.0601	.....	
38,000	.....	.0740	.....	
40,000	.....	.0906	.....	
42,000	.....	.10	.....	
44,000	.....	.12	.....	
46,000	.....	.15	.....	
48,000	.....	.17	.....	
50,000	.....	.20	.....	
Test completed after a further rest of 40 hours.				
51,000	.....	.21	.....	
52,000	.....	.22	.....	
53,000	.....	.25	.....	
54,000	.....	.32	.....	
54,740	.....	.39	.....	Tensile strength.
	109,480	.....	.....	On original area.
	114,520	.....	.....	On reduced area.
53,000	146,040	.....	.....	At time of fracture.
0	0	.60	.....	= 12.0 per cent.

Fractured 2″.2 from neck. Appearance, fine granular; small dull spot near center.

Local contraction, 1″.10 each side of fracture.

Diameter at fracture, ″.68. Area, .363 square inch.

Contraction, 27.4 per cent.

Elongation of inch sections, ″.05, ″.09, ″.19, ″.20*, ″.07.

No. 1897.

Marks, 6–797.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0583 in 6 inches.
Estimated temperature, 1592° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
2,000	4,000	.0011	.....	
3,000	6,000	.0030	.....	
4,000	8,000	.0054	.....	
5,000	10,000	.0084	.....	
6,000	12,000	.0129	.....	
7,000	14,000	.0213	.....	
8,000	16,000	.0364	.....	
8,880	17,720	.0940	.....	Tensile strength.
8,500	.....	.....	.....	Hot test discontinued.
0	0	.20	.....	= 4.0 per cent.

Elongation of inch sections, ″.02, ″.07, ″.07, ″.03, ″.02.
Minimum diameter, ″.761. Area, .455 square inch. Contraction, 9.0 per cent.
Surface of stem, blue black.
Rested 24 hours, and test then completed at temperature of 70° Fahr.
Gauged length, 5″.20.
Mean sectional area, .481 square inch.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
500	.....	0.	0.	Initial load.
1,000	.....	.0001	.....	
5,000	.....	.0016	.....	E = 29,630,000 pounds between 5,000 and 25,000 pounds.
10,000	.....	.0034	.....	
15,000	.....	.0052	.....	
20,000	.....	.0071	.....	
25,000	.....	.0089	.....	
26,000	.....	.0094	.....	Elastic limit.
	52,000	.....	.....	On original area.
	57,140	.....	.....	On reduced area.
27,000	.....	.0185	.....	
28,000	.....	.0252	.....	
29,000	.....	.0387	.....	
30,000	.....	.0457	.....	
32,000	.....	.0615	.....	
34,000	.....	.0763	.....	
36,000	.....	.0984	.....	
38,000	.....	.1115	.....	
40,000	.....	.1325	.....	
42,000	.....	.17	.....	
44,000	.....	.21	.....	
46,000	.....	.25	.....	
48,000	.....	.34	.....	
48,460	.....	.38	.....	Tensile strength.
	90,920	.....	.....	On original area.
	106,510	.....	.....	On reduced area.
47,600	134,840	.....	.....	At time of fracture.
0	0	.55	.....	= 11.0 per cent. total elongation.

No. 1897—Continued.

Fractured 2″.4 from neck. Appearance, fine granular; dull spot at center.

Local contraction, 1″.20 each side of fracture.

Diameter at fracture, ″.67. Area, .353 square inch. Contraction, 29.4 per cent.

Elongation of inch sections, ″.05, ″.18, ″.21*, ″.07, ″.04.

No. 1791.

Marks, 6–797.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0587 in 6 inches.
Estimated temperature, 1603° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
2,000	4,000	.0011	.....	
3,000	6,000	.0036	.....	No elastic limit apparent.
3,500	7,000	.0054	.....	
4,000	8,000	.0068	.....	
4,500	9,000	.0088	.....	
5,000	10,000	.0095	.....	
5,500	11,000	.0112	.....	
6,000	12,000	.0144	.....	
6,500	13,000	.0165	.....	
7,000	14,000	.0201	.....	
7,500	15,000	.0262	.....	
8,000	16,000	.0328	.....	
8,500	17,000	.0104	.....	
9,000	18,000	.0520	.....	
9,500	19,000	.0706	.....	
10,000	20,000	.0992	.....	
10,500	21,000	.1989	.....	Tensile strength.
0	0	1.19	.....	= 23.8 per cent.

Fractured 2″.75 from neck. Appearance, silky; cup-shaped ends; both ends concave from ″.03 to ″.05 each. Dark-blue color. Surface of stem, blue. Raised a scale.

Local contraction, ″.15 each side of fracture.

Diameter at fracture, ″.23. Area, .042 square inch. Contraction, 91.6 per cent.

Elongation of inch sections, ″.04, ″.28, ″.80*, ″.05, ″.02.

No. 1898.

Marks, 6–797.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, .″0599 in 6 inches.
Estimated temperature, 1634° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
2,000	4,000	.0018	.....	
3,000	6,000	.0041	.....	
4,000	8,000	.0078	.....	
5,000	10,000	.0159	.....	
6,000	12,000	.0290	.....	
7,000	14,000	.0603	.....	
7,260	14,520	.1101	.....	Tensile strength.
5,000	.....	.....	.....	Hot test discontinued.
0	0	.69	.....	=13.8 per cent. total elongation.

Elongation of inch sections, ″.02, ″.15, ″.44, ″.07, ″.01.
Minimum diameter, ″.59. Area, .273 square inch. Contraction, 45.4 per cent.
Surface of stem, blue black.
Rested 24 hours, and test then completed at temperature of 70° Fahr.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
29,980	.....	.....	.....	Tensile strength.
	59,960	.....	.....	On original area.
	109,820	.....	.....	On reduced area.
0	0	.83	.....	=16.6 per cent. total elongation.

Fractured 2″.7 from neck. Appearance, fine silky center; granular near circumference.
Local contraction, 1″.5 each side of fracture.
Diameter at fracture, ″.49. Area, .189 square inch. Contraction, 62.2 per cent.
Elongation of inch sections, ″.02, ″.16, ″.56*, ″.07, ″.02.

No. 1776.

Marks, 7–823.
Diameter, ″.798.
Sectional area, .50 square inch.
Temperature, 8° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
5,000	10,000	.0016	.....	
10,000	20,000	.0038	.....	
15,000	30,000	.0054	.....	
20,000	40,000	.0069	.....	
25,000	50,000	.0089	.....	
30,000	60,000	.0103	.....	
30,500	61,000	.0105	.....	Elastic limit.
31,000	62,000	.0190	.....	
		.0255	.....	
32,000	64,000	.0327	.....	
34,000	68,000	.0433	.....	
36,000	72,000	.0538	.....	
38,000	76,000	.0674	.....	
40,000	80,000	.0798	.....	
42,000	84,000	.0913	.....	
44,000	88,000	.1055	.....	
46,000	92,000	.1223	.....	
48,000	96,000	.1396	.....	
50,000	100,000	.1587	.....	
52,000	104,000	.185	.....	
54,000	108,000	.21	.....	
55,000	110,000	.23	.....	
56,000	112,000	.25	.....	
57,000	114,000	.275	.....	
58,000	116,000	.30	.....	
59,000	118,000	.34	.....	
60,000	120,000	.40	.....	
60,800	121,600	.55	.....	Tensile strength.
58,700	152,470	.....	.....	At time of rupture.
0	0	.60	.....	=12.0 per cent.

Fractured 1″ from neck. Appearance, granular, radiating from a point near the center.

Local contraction, 1″ each side of fracture.

Diameter at fracture, ″.70. Area, .385 square inch. Contraction, 23.0 per cent.

Elongation of inch sections, ″.07, ″.08, ″.10, ″.14, ″.21.

No. 1813.

Marks, 7–823.
Diameter, ″.798.
Sectional area, .50 square inch.
Temperature, 70° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
5,000	10,000	.0014	.....	
10,000	20,000	.0031	.....	
15,000	30,000	.0049	.....	
20,000	40,000	.0065	.....	
25,000	50,000	.0081	.....	
26,000	52,000	.0085	.....	
27,000	54,000	.0088	.....	
27,500	55,000	.0091	.....	
28,000	56,000	.0092	.....	
28,500	57,000	.0094	.....	
29,000	58,000	.0096 .0118	.....	Elastic limit.
29,500	59,000	.0259	.....	
30,000	60,000	.0285	.....	
31,000	62,000	.0346	.....	
32,000	64,000	.0396	.....	
33,000	66,000	.0448	.....	
34,000	68,000	.0508	.....	
35,000	70,000	.0561	.....	
36,000	72,000	.0621	.....	
38,000	76,000	.0755	.....	
40,000	80,000	.0896	.....	
42,000	84,000	.1038	.....	
44,000	88,000	.1205	.....	
46,000	92,000	.1382	.....	
48,000	96,000	.1591	.....	
50,000	100,000	.18	.....	
52,000	104,000	.215	.....	
54,000	108,000	.245	.....	
56,000	112,000	.31	.....	
58,000	116,000	.425	.....	
58,880	117,760	.58	.....	Tensile strength.
55,900	149,470	.....	.....	At time of fracture.
0	0	.73	.....	= 14.6 per cent.

Fractured 2″.70 from neck. Appearance, granular, radiating from a dull spot at center.

Diameter at fracture, ″.69. Area, .374 square inch. Contraction, 25.2 per cent.

Elongation of inch sections, ″.09, ″.12, ″.28*, ″.15, ″.09.

No. 1795.

Marks, 7–823.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0075 in 6 inches.
Estimated temperature, 263° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
5,000	10,000	.0007	.....	
10,000	20,000	.0022	.....	
15,000	30,000	.0040	.....	
20,000	40,000	.0054	.....	
25,000	50,000	.0069	.....	
26,000	52,000	.0071	.....	
27,000	54,000	.0072	.....	
27,500	55,000	.0075 .0148	.....	Elastic limit.
28,000	56,000	.0201	.....	
29,000	58,000	.0206	.....	
30,000	60,000	.0214	.....	
31,000	62,000	.0331	.....	Throbs.
32,000	64,000	.0373	.....	
34,000	68,000	.0398	.....	
35,000	70,000	.0507	.....	
36,000	72,000	.0632	.....	
37,000	74,000	.0658	.....	
39,000	78,000	.0713	.....	
40,000	80,000	.0849	.....	
41,000	82,000	.0910	.....	
42,000	84,000	.1027	.....	
43,000	86,000	.1097	.....	
44,000	88,000	.1164	.....	
45,000	90,000	.1302	.....	
46,000	92,000	.1339	.....	
47,000	94,000	.1440	.....	
48,000	96,000	.1542	.....	
49,000	98,000	.1690	.....	
50,000	100,000	.1883	.....	
51,000	102,000	.195	.....	
52,000	104,000	.20	.....	
53,000	106,000	.225	.....	
54,000	108,000	.265	.....	Violent throbs.
55,000	110,000	.33	.....	
56,000	112,000	.395	.....	
56,200	112,400	.48	.....	Tensile strength.
54,700	146,260	.....	.....	At time of fracture.
0	0	.47	.....	=9.4 per cent.

Fractured ″.85 from neck. Appearance, silky; slightly granular. Cup-shaped ends.

Local contraction, ″.8 each side of fracture.

Diameter at fracture, ″.69. Area, .374 square inch. Contraction, 25.2 per cent.

Elongation of inch sections, ″.20*, ″.10, ″.07, ″.06, ″.04.

No. 1927.

Marks, 7–823.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0103 in 6 inches.
Estimated temperature, 335° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
5,000	10,000	.0013	.....	
10,000	20,000	.0027	.....	
15,000	30,000	.0035	.....	
20,000	40,000	.0043	.....	
25,000	50,000	.0049	.....	
27,000	54,000	.0052	.....	
27,600	55,200	.....	.....	Elastic limit.
Load fell.				
27,000	54,000	.0145	.....	Throbs.
28,000	56,000	.0150	.....	
29,000	58,000	.0154	.....	
30,000	60,000	.0160	.....	
31,000	62,000	.0294	.....	
32,000	64,000	.0300	.....	
33,000	66,000	.0304	.....	
34,000	68,000	.0309	.....	
35,000	70,000	.0457	.....	
36,000	72,000	.0467	.....	Hot test discontinued.
0	0	.05	.....	=1.0 per cent.

Elongation of inch sections, ″.01, ″.01, ″.01, ″.01, ″.01.
Minimum diameter, ″.7954. Area, .497 square inch. Contraction, 0.6 per cent.
Rested 10 days, and then test completed at temperature of 70° Fahr.
Gauged length, 5″.04.
Mean sectional area, .496 square inch.

No. 1927—Continued.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	.....	0.	0.	Initial load.
5,000	.....	.0011	.....	
10,000	.....	.0030	.....	
15,000	.....	.0045	.....	E = 29,080,000 pounds between 5,000 and 35,000 pounds.
20,000	.....	.0062	.....	
25,000	.....	.0080	.....	
30,000	.....	.0098	.....	
35,000	.....	.0115	.....	
36,000	.....	.0118	.....	
37,000	.....	.0121	.....	
38,000	.....	.0125	.....	
39,000	.....	.0130	.....	
40,000	.....	.0135	.0000	Elastic limit.
	80,000	.....	.....	On original area.
	80,480	.....	.....	On reduced area.
41,000	.....	.0438	.....	
42,000	.....	.0550	.....	
43,000	.....	.0640	.....	
44,000	.....	.0738	.....	
46,000	.....	.08	.....	
48,000	.....	.10	.....	
50,000	.....	.13	.....	
52,000	.....	.175	.....	
54,000	.....	.19	.....	
56,000	.....	.26	.....	
58,000	.....	.40	.....	
58,160	.....	.....	.....	Tensile strength.
	116,320	.....	.....	On original area
	117,020	.....	.....	On reduced area.
55,900	141,160	.....	.....	At time of fracture.
0	0	.69	.....	=13.8 per cent. total elongation.

Fractured 2″.26 from neck. Appearance, granular, radiating from center-punch mark in the circumference.

Local contraction, 1″ each side of fracture.

Diameter at fracture, ″.71. Area, .396 square inch. Contraction, 20.8 per cent.

Elongation of inch sections, ″.09, ″.17*, ″.22*, ″.13, ″.08.

No. 1796.

Marks, 7–823.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0105 in 6 inches.
Estimated temperature, 341° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
5,000	10,000	.0020	.....	
10,000	20,000	.0032	.....	
15,000	30,000	.0048	.....	
20,000	40,000	.0068	.....	
25,000	50,000	.0087	.....	
26,000	52,000	.0096	.....	
26,500	53,000	.0097	.....	
27,000	54,000	.0100	.....	Elastic limit.
27,500	55,000	.0138	.....	
28,000	56,000	.0157	.....	
29,000	58,000	.0190	.....	
30,000	60,000	.0224	.....	
32,000	64,000	.0303	.....	
34,000	68,000	.0384	.....	
36,000	72,000	.0462	.....	
38,000	76,000	.0540	.....	
40,000	80,000	.0622	.....	
42,000	84,000	.0722	.....	
44,000	88,000	.0822	.....	
46,000	92,000	.0962	.....	
48,000	96,000	.1085	.....	
50,000	100,000	.1224	.....	
51,000	102,000	.1309	.....	
52,000	104,000	.1391	.....	
53,000	106,000	.1494	.....	
54,000	108,000	.16	.....	
55,000	110,000	.165	.....	
56,000	112,000	.18	.....	Throbs.
57,000	114,000	.205	.....	
58,000	116,000	.235	.....	
59,000	118,000	.265	.....	
60,000	120,000	.31	.....	
60,400	120,800	.....	.....	Tensile strength.
60,000	147,420	.....	.....	At time of fracture.
0	0	.38	.....	=7.6 per cent.

Fractured ″.75 from the neck. Appearance, silky; no change in color. Surface of stem, light straw color.

Local contraction extends to the neck, and ″.8 from fracture.

Diameter at fracture, ″.72. Area, .407 square inch. Contraction, 18.6 per cent.

Elongation of inch sections, ″.05, ″.05, ″.06, ″.07, ″.15*.

No. 1930.

Marks, 7–823.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0133 in 6 inches.
Estimated temperature, 413° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
5,000	10,000	.0021	.....	
10,000	20,000	.0034	.....	
15,000	30,000	.0044	.....	
20,000	40,000	.0054	.....	
21,000	42,000	.0057	.....	
22,000	44,000	.0060	.....	
23,000	46,000	.0063	.....	
24,000	48,000	.0066	.....	
25,000	50,000	.0069	.....	
26,000	52,000	.0078	.....	Elastic limit.
27,000	54,000	.0111	.....	
28,000	56,000	.0143	.....	
29,000	58,000	.0172	.....	
30,000	60,000	.0204	.....	
31,000	62,000	.0235	.....	
32,000	64,000	.0268	.....	
34,000	68,000	.0343	.....	
36,000	72,000	.0420	.....	
38,000	76,000	.0513	.....	
40,000	80,000	.0607	.....	
42,000	84,000	.0702	.....	
44,000	88,000	.0807	.....	
45,000	90,000	.0875	.....	
.....	.....	.0925	.....	After one minute.
.....	.....	.0937	.....	After two minutes.
.....	.....	.....	.....	Hot test discontinued.
0	0	.085	.....	= 1.7 per cent.

Minimum diameter, ″.7910. Area, .491 square inch. Contraction, 1.8 per cent.

Bar rested twelve days, and the test completed at temperature of 70° Fahr.

Gauged length, 5″.08.

Mean sectional area, .492 square inch.

No. 1930—Continued.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	.....	0.	0.	Initial load.
5,000	.....	.0013	.....	
10,000	.....	.0031	.....	E = 29,307,000 between 5,000 and 350,00 pounds.
15,000	.....	.0048	.....	
20,000	.....	.0066	.....	
25,000	.....	.0082	.....	
30,000	.....	.0101	.....	
35,000	.....	.0119	0.	
40,000	.....	.0136	.....	
45,000	.....	.0154	.....	
49,000	.....	.0172	.....	
50,000	.....	.0179	.....	
50,900	.....	.....	.....	Elastic limit.
	101,800	.....	.....	On original area.
	103,670	.....	.....	On reduced area.
Load fell.				
49,200	.....	.0230	.....	
49,500	.....	.0240	.....	
50,000	.....	.0450	.....	
51,000	.....	.0824	.....	
52,000	.....	.0972	.....	
54,000	.....	.12	.....	
56,000	.....	.16	.....	
58,000	.....	.22	.....	
59,000	.....	.29	.....	
59,680	.....	.39	.....	Tensile strength.
	119,360	.....	.....	On original area.
	121,550	.....	.....	On reduced area.
57,600	141,520	.....	.....	At time of fracture.
0	0	.66	.....	= 13.2 per cent. total elongation.

Fractured 1″.13 from neck. Appearance, granular, radiating from center-punch mark at circumference.

Local contraction 1.″20, and ″.90 from fracture.

Diameter at fracture, ″.72. Area, .407 square inch. Contraction, 18.6 per cent.

Elongation of inch sections, ″.08, ″.10, ″.12, ″.22*, ″.14*.

No. 1928.

Marks, 7–823.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0136 in 6 inches.
Estimated temperature, 421° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
20,000	40,000	.0040	.....	
21,000	42,000	.0045	.....	
22,000	44,000	.0048	.....	
23,000	46,000	.0052	.....	
24,000	48,000	.0056	.....	
25,000	50,000	.0064	.....	Elastic limit.
26,000	52,000	.0086	.....	
27,000	54,000	.0108	.....	
27,500	55,000	.0124	.....	
28,000	56,000	.0143	.....	
29,000	58,000	.0176	.....	
30,000	60,000	.0199	.....	
31,000	62,000	.0228	.....	
32,000	64,000	.0259	.....	
33,000	66,000	.0293	.....	
34,000	68,000	.0329	.....	
35,000	70,000	.0372	.....	
36,000	72,000	.0415	.....	
Hot test discontinued.				
0	0	.05	.....	=1 per cent.

Elongation of inch sections, ″.01, ″.01, ″.01, ″.01, ″.01.
Minimum diameter, ″.7958. Area, ″.497 square inch. Contraction, 0.6 per cent.
Rested 13 days and then test completed at temperature of 70° Fahr.
Gauged length, 5″.04.
Mean sectional area, .496 square inch.

No. 1928—Continued.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	.....	0.	0.	Initial load.
5,000	.....	.0015	.....	
10,000	.....	.0031	.....	
15,000	.....	.0048	.....	E = 30,240,000 pounds between 5,000 and 35,000 pounds.
20,000	.....	.0065	.....	
25,000	.....	.0082	.....	
30,000	.....	.0099	.....	
35,000	.....	.0116	0.	
40,000	.....	.0134	.....	
41,000	.....	.0140	.....	
41,200	.....	.....	.....	Elastic limit.
	82,400	.....	.....	On original area.
	82,900	.....	.....	On reduced area.
Load fell.				
40,000	.....	.0175	.....	
40,500	.....	.0287	.....	
41,000	.....	.0495	.....	
42,000	.....	.0580	.....	
43,000	.....	.0665	.....	
44,000	.....	.0755	.....	
46,000	.....	.0933	.....	
48,000	.....	.1125	.....	
50,000	.....	.13	.....	
52,000	.....	.16	.....	
54,000	.....	.20	.....	
56,000	.....	.25	.....	
58,000	.....	.31	.....	
59,000	.....	.38	.....	
59,370	.....	.53	.....	Tensile strength.
	118,740	.....	.....	On original area.
	119,460	.....	.....	On reduced area.
57,400	144,950	.....	.....	At time of fracture.
0	0	.66	.....	= 13.2 per cent. total elongation.

Fractured 2.″75 from neck. Appearance, granular, radiating from a dull spot at the center.

Local contraction, 1″ each side of fracture.

Diameter at fracture, ″.71. Area, .396 square inch. Contraction, 20.8 per cent.

Elongation of inch sections, ″.09, ″.13, ″.21*, ″.13, ″.10.

No. 1797.

Marks, 7–823.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0162 in 6 inches.
Estimated temperature, 488° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
2,000	4,000	.0005	.....	
5,000	10,000	.0022	.....	
10,000	20,000	.0044	.....	
15,000	30,000	.0061	.....	
20,000	40,000	.0080	.....	
21,000	42,000	.0084	.....	
22,000	44,000	.0089	.....	
23,000	46,000	.0092	.....	Elastic limit.
23,500	47,000	.0098	.....	
24,000	48,000	.0105	.....	
24,500	49,000	.0112	.....	
25,000	50,000	.0124	.....	
26,000	52,000	.0149	.....	
27,000	54,000	.0177	.....	
28,000	56,000	.0208	.....	
29,000	58,000	.0232	.....	
30,000	60,000	.0266	.....	
32,000	64,000	.0341	.....	
34,000	68,000	.0414	.....	
36,000	72,000	.0492	.....	
38,000	76,000	.0575	.....	
40,000	80,000	.0672	.....	
42,000	84,000	.0777	.....	
44,000	88,000	.0889	.....	
46,000	92,000	.1011	.....	
48,000	96,000	.1147	.....	
50,000	100,000	.1280	.....	
52,000	104,000	.1443	.....	
54,000	108,000	.1628	.....	
56,000	112,000	.1831	.....	
58,000	116,000	.20	.....	
60,000	120,000	.235	.....	
61,000	122,000	.255	.....	
62,000	124,000	.275	.....	
63,000	126,000	.31	.....	
64,000	128,000	.35	.....	
65,000	130,000	.41	.....	
66,000	132,000	.50	.....	
66,100	132,200	.53	.....	Tensile strength = 11.2 per cent
0	0	.56	.....	

Fractured ″.75 from neck. Appearance, silky; straw color. Surface of stem varies in color from purple to blue.

Local contraction extends to neck and ″.8 from fracture.

Diameter at fracture, ″.73. Area, .419 square inch. Contraction, 16.2 per cent.

Elongation of inch sections, ″.09, ″.10, ″.11, ″.10, ″.16*.

No. 1931.

Marks, 7–823.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0215 in 6 inches.
Estimated temperature, 624° Fahr.
Guaged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
5,000	10,000	.0004	.....	
10,000	20,000	.0016	.....	
15,000	30,000	.0025	.....	
20,000	40,000	.0048	.....	
21,000	42,000	.0053	.....	
22,000	44,000	.0061	.....	Elastic limit.
23,000	46,000	.0075	.....	
24,000	48,000	.0090	.....	
25,000	50,000	.0110	.....	
26,000	52,000	.0134	.....	
27,000	54,000	.0161	.....	
28,000	56,000	.0190	.....	
29,000	58,000	.0220	.....	
30,000	60,000	.0256	.....	
32,000	64,000	.0323	.....	
34,000	68,000	.0418	.....	
36,000	72,000	.0507	.....	
38,000	76,000	.0609	.....	
40,000	80,000	.0718	.....	
42,000	84,000	.0833	.....	
44,000	88,000	.0960	.....	
45,000	90,000	.1028	.....	
.....	.....	.1123	.....	After 1 minute.
.....	.....	.1147	.....	After 2 minutes.
.....	.....	.1160	.....	After 3 minutes.
.....	.....	.1168	.....	After 4 minutes.
.....	.....	.1176	.....	After 5 minutes.
Hot test discontinued.				
0	0	.11	.....	=2.2 per cent.

Minimum diameter, ″.7898. Area, .490 square inch. Contraction, 2 per cent.

Bar rested 12 days, and then test completed at temperature of 70° Fahr.

Gauged length, 5″.10.

Mean sectional area, .490 square inch.

No. 1931—Continued.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	.....	0.	0.	Initial load.
5,000	.....	.0014	.....	
10,000	.....	.0032	.....	E = 29,480,000 pounds, between 5,000 and 35,000 pounds.
15,000	.....	.0058	.....	
20,000	.....	.0068	.....	
25,000	.....	.0085	.....	
30,000	.....	.0105	.....	
35,000	.....	.0120	0.	
40,000	.....	.0140	.....	
45,000	.....	.0157	.....	
50,000	.....	.0175	.....	
51,000	.....	.0179	.....	
52,000	.....	.0183	.....	
53,000	.....	.0188	.....	Elastic limit.
	106,000	.....	.....	On original area.
	108,160	.....	.....	On reduced area.
Load fell.				
52,500	.....	.0245	.....	
53,000	.....	.0330	.....	
54,000	.....	.0835	.....	
55,000	.....	.1010	.....	
56,000	.....	.115	.....	
58,000	.....	.15	.....	
59,000	.....	.18	.....	
60,000	.....	.23	.....	
61,000	.....	.30	.....	
61,100	.....	.39	.....	Tensile strength.
	122,200	.....	.....	On original area.
	124,690	.....	.....	On reduced area.
58,600	147,980	.....	.....	At time of fracture.
0	0	.58	.....	=11.6 per cent. total elongation.

Fractured 1″.30 from neck. Appearance, granular, radiating from a dull spot at the center.

Local contraction, 1″ each side of fracture.

Diameter at fracture, ″.71. Area, .396 square inch. Contraction, 20.8 per cent.

Elongation of inch sections, ″.12, ″.19*, ″.10, ″.09, ″.08.

No. 1929.

Marks, 7–823.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0219 in 6 inches.
Estimated temperature, .634° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
5,000	10,000	.0025	.....	
10,000	20,000	.0046	.....	
15,000	30,000	.0063	.....	
20,000	40,000	.0089	.....	
21,000	42,000	.0098	.....	
22,000	44,000	.0105	.....	Elastic limit.
23,000	46,000	.0118	.....	
24,000	48,000	.0138	.....	
25,000	50,000	.0156	.....	
26,000	52,000	.0182	.....	
27,000	54,000	.0212	.....	
28,000	56,000	.0242	.....	
29,000	58,000	.0275	.....	
30,000	60,000	.0308	.....	
31,000	62,000	.0346	.....	
32,000	64,000	.0390	.....	
33,000	66,000	.0432	.....	
34,000	68,000	.0479	.....	
35,000	70,000	.0517	.....	
36,000	72,000	.0576	.....	
.....	.....	.0629	.....	After 1 minute.
.....	.....	.0639	.....	After 2 minutes.
.....	.....	.0646	.....	After 3 minutes.
.....	.....	.0650	.....	After 4 minutes.
.....	.....	.0656	.....	After 5 minutes.
.....	.....	.0659	.....	After 6 minutes.
.....	.....	.0663	.....	After 7 minutes.
.....	.....	.0666	.....	After 8 minutes.
.....	.....	.0668	.....	After 9 minutes.
.....	.....	.0678	.....	After 10 minutes.
Hot test discontinued.				
0	0	.06	.....	=1.2 per cent.

Minimum diameter, ″.7944. Area, .496 square inch. Contraction, 0.8 per cent.

Bar rested 12 days, and test then completed at temperature of 70° Fahr.

Gauged length, 5″.05.

Mean sectional area, .495 square inch.

No. 1929—Continued.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	.....	0.	0.	Initial load.
5,000	.....	.0013	.....	
10,000	.....	.0031	.....	
15,900	.....	.0046	.....	E=29,706,000 pounds between 5,000 and 35,000 pounds.
20,000	.....	.0065	.....	
25,000	.....	.0081	.....	
30,000	.....	.0101	.....	
35,000	.....	.0116	.....	
40,000	.....	.0134	.....	
41,000	.....	.0137	.....	
42,000	.....	.0141	.....	
43,000	.....	.0145	.....	
44,000	.....	.0149	.....	
44,500	.....	.....	.....	Elastic limit.
	89,160	.....	.....	On original area.
	89,720	.....	.....	On reduced area.
Load fell.				
43,500	.....	.0198	.....	
44,000	.....	.0530	.....	
45,000	.....	.0642	.....	
46,000	.....	.0728	.....	
48,000	.....	.0940	.....	
50,000	.....	.1143	.....	
52,000	.....	.14	.....	
54,000	.....	.17	.....	
56,000	.....	.20	.....	
57,000	.....	.25	.....	
58,000	.....	.28	.....	
59,000	.....	.35	.....	
59,700	.....	.49	.....	Tensile strength.
	119,400	.....	.....	On original area.
	120,360	.....	.....	On reduced area.
57,700	145,710	.....	.....	At time of fracture.
0	0	.66	.....	=13.2 per cent.

Fractured 2″.6 from neck. Appearance, granular, radiating from a dull spot at the center.

Local contraction, ″.9 each side of fracture.

Diameter at fracture, ″.71. Area, .396 square inch. Contraction, 20.8 per cent.

Elongation of inch sections, ″.09, ″.12. ″.21*, ″.15, ″.09.

No. 1923.

Marks, 7–823.
Diameter, ".798.
Sectional area, .50 square inch.
Expansion, ".0221 in 6 inches.
Estimated temperature, 640° Fahr.
Gauged length, 5".

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
7,000	14,000	.0040	.....	
10,000	20,000	.0050	.....	
15,000	30,000	.0067	.....	
17,000	34,000	.0075	.....	
20,000	40,000	.0090	.....	
21,000	42,000	.0107	.....	
22,000	44,000	.0111	.....	
23,000	46,000	.0125	.....	
24,000	48,000	.0140	.....	Elastic limit. Not well defined.
		.0160	.....	After 1 minute.
25,000	50,000	.0166	.....	
26,000	52,000	.0189	.....	
27,000	54,000	.0225	.....	
28,000	56,000	.0260	.....	
29,000	58,000	.0287	.....	
30,000	60,000	.0321	.....	
.....	.....	.0362	.....	After 1 minute.
.....	.....	.0366	.....	After 2 minutes.
.....	.....	.0373	.....	After 3 minutes.
.....	.....	.0377	.....	After 4 minutes.
.....	.....	.0380	.....	After 5 minutes.
.....	.....	.0382	.....	After 6 minutes.
31,000	62,000	.0387	.....	
32,000	64,000	.0389	.....	
33,000	66,000	.0449	.....	
34,000	68,000	.0516	.....	
35,000	70,000	.0577	.....	
.....	.....	.0614	.....	After 1 minute.
.....	.....	.0624	.....	After 2 minutes.
.....	.....	.0628	.....	After 3 minutes.
.....	.....	.0635	.....	After 5 minutes.
36,000	72,000	.0639	.....	
37,000	74,000	.0643	.....	
38,000	76,000	.0673	.....	
39,000	78,000	.0757	.....	
40,000	80,000	.0829	.....	
.....	.....	.0910	.....	After 1 minute.
.....	.....	.0931	.....	After 2 minutes.
.....	.....	.0939	.....	After 3 minutes.
.....	.....	.0941	.....	After 4 minutes.
.....	.....	.0946	.....	After 5 minutes.
41,000	82,000	.0971	.....	
42,000	84,000	.0974	.....	
43,000	86,000	.0994	.....	
44,000	88,000	.1117	.....	
45,000	90,000	.1185	.....	
.....	.....	.1291	.....	After 1 minute.
.....	.....	.1311	.....	After 2 minutes.
.....	.....	.1324	.....	After 3 minutes.
.....	.....	.1331	.....	After 4 minutes.
.....	.....	.1338	.....	After 5 minutes.
47,000	94,000	.1340	.....	
48,000	96,000	.1376	.....	
49,000	98,000	.1494	.....	
50,000	100,000	.1618	.....	
51,000	102,000	.1766	.....	
52,000	104,000	.1848	.....	
53,000	106,000	.1972	.....	
54,000	108,000	.2083	.....	
55,000	110,000	.2258	.....	
56,000	112,000	.2451	.....	
57,000	114,000	.2700	.....	
58,000	116,000	.2928	.....	

No. 1923—Continued.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
59,000	118,000	.32	.....	
60,000	120,000	.35	.....	
61,000	122,000	.41	.....	
62,000	124,000	.50	.....	
62,380	124,760	.58	.....	Tensile strength.
51,500	165,060	.....	.....	At time of fracture.
0	0	.92	.....	= 18.4 per cent.

Fractured 1″.20 from neck. Appearance, silky; deep-blue color. Surface of stem blue black, in part brown.

Local contraction, 1″ each side of fracture.

Diameter at fracture, ″.63. Area, .312 square inch. Contraction, 37.6 per cent.

Elongation of inch sections, ″.31*, ″.24, ″.15, ″.12, ″.10.

No. 1798.

Marks, 7–823.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0245 in 6 inches.
Estimated temperature, 701° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
5,000	10,000	.0027	.....	
10,000	20,000	.0043	.....	
15,000	30,000	.0061	.....	
20,000	40,000	.0094	.....	
20,500	41,000	.0097	.....	
21,000	42,000	.0103	.....	
21,500	43,000	.0109	.....	
22,000	44,000	.0116	.....	
22,500	45,000	.0123	.....	
23,000	46,000	.0130	.....	Elastic limit.
23,500	47,000	.0139	.....	
24,000	48,000	.0150	.....	
24,500	49,000	.0162	.....	
25,000	50,000	.0174	.....	
26,000	52,000	.0200	.....	
28,000	56,000	.0270	.....	
30,000	60,000	.0351	.....	
32,000	64,000	.0438	.....	
34,000	68,000	.0534	.....	
36,000	72,000	.0639	.....	
38,000	76,000	.0745	.....	
40,000	80,000	.0869	.....	
42,000	84,000	.0959	.....	
44,000	88,000	.1154	.....	
46,000	92,000	.1329	.....	
48,000	96,000	.1497	.....	
50,000	100,000	.1703	.....	
52,000	104,000	.195	.....	
53,000	106,000	.215	.....	
54,000	108,000	.235	.....	
55,000	110,000	.25	.....	
56,000	112,000	.27	.....	
57,000	114,000	.30	.....	
58,000	116,000	.345	.....	
58,960	117,920	.465	.....	Tensile strength.
49,500	153,730	.....	.....	At time of fracture.
0	0	.77	.....	=15.4 per cent.

Fractured 1″.60 from neck. Appearance, silky, blue black, cup-shaped ends. Surface of stem, blue-black color with purple cast.

Local contraction, ″.9 each side of fracture.

Diameter at fracture, ″.64. Area, .322 square inch. Contraction, 35.6 per cent.

Elongation of inch sections, ″.17, ″.33,* ″.13, ″.08, ″.06.

No. 1799.

Marks, 7–823.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0301 in 6 inches.
Estimated temperature, 846° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
5,000	10,000	.0020	.....	
10,000	20,000	.0038	.....	
15,000	30,000	.0060	.....	
16,000	32,000	.0064	.....	
17,000	34,000	.0070	.....	
18,000	36,000	.0076	.....	
19,000	38,000	.0082	.....	Elastic limit.
20,000	40,000	.0097	.....	
21,000	42,000	.0105	.....	
21,500	43,000	.0110	.....	
22,000	44,000	.0125	.....	
22,500	45,000	.0132	.....	
23,000	46,000	.0140	.....	
23,500	47,000	.0148	.....	
24,000	48,000	.0165	.....	
25,000	50,000	.0192	.....	
26,000	52,000	.0227	.....	
27,000	54,000	.0263	.....	
28,000	56,000	.0310	.....	
29,000	58,000	.0356	.....	
30,000	60,000	.0401	.....	
32,000	64,000	.0505	.....	
34,000	68,000	.0624	.....	
36,000	72,000	.0757	.....	
38,000	76,000	.0890	.....	
40,000	80,000	.1054	.....	
42,000	84,000	.1229	.....	
44,000	88,000	.1442	.....	
46,000	92,000	.1709	.....	
47,000	94,000	.1885	.....	
48,000	96,000	.22	.....	
49,000	98,000	.25	.....	
50,000	100,000	.275	.....	
51,000	102,000	.335	.....	
51,100	102,200	.375	.....	Tensile strength.
37,400	128,080	.....	.....	At time of fracture.
0	0	.74	.....	14.8 per cent.

Fractured 2″.25 from neck. Appearance, silky. Surface of fracture and stem, blue-black color.

Local contraction, 1″.1 each side of fracture.

Diameter at fracture, ″.61. Area, .292 square inch. Contraction, 41.6 per cent.

Elongation of inch sections, ″.07, ″.32*, ″.22*, ″.08, ″.05.

No. 1800.

Marks, 7–823.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0363 in 6 inches.
Estimated temperature, 1006° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
5,000	10,000	.0019	.....	
10,000	20,000	.0039	.....	
15,000	30,000	.0068	.....	
16,000	32,000	.0075	.....	
17,000	24,000	.0080	.....	
17,500	35,000	.0087	.....	
18,000	36,000	.0094	.....	
18,500	37,000	.0099	.....	
19,000	38,000	.0109	.....	
19,500	39,000	.0114	.....	Elastic limit.
20,000	40,000	.0124	.....	
20,500	41,000	.0136	.....	
21,000	42,000	.0145	.....	
21,500	43,000	.0158	.....	
22,000	44,000	.0172	.....	
22,500	45,000	.0189	.....	
23,000	46,000	.0211	.....	
24,000	48,000	.0250	.....	
25,000	50,000	.0294	.....	
26,000	52,000	.0358	.....	
27,000	54,000	.0419	.....	
28,000	56,000	.0487	.....	
29,000	58,000	.0555	.....	
30,000	60,000	.0628	.....	
31,000	62,000	.0708	.....	
32,000	64,000	.0800	.....	
33,000	66,000	.0900	.....	
34,000	68,000	.1006	.....	
35,000	70,000	.1134	.....	
36,000	72,000	.1269	.....	
37,000	74,000	.1433	.....	
38,000	76,000	.1622	.....	
39,000	78,000	.1869	.....	
40,000	80,000	.2401	.....	Tensile strength.
23,200	97,480	.....	.....	At time of fracture.
0	0	.83	.....	=16.6 per cent.

Fractured 2″.4 from neck. Appearance, silky; blue-black color. Surface of stem same color.

Local contraction, 1″.2 each side of fracture.

Diameter at fracture, ″.55. Area, .238 square inch. Contraction, 52.4 per cent.

Elongation of inch sections, ″.08, ″.45*, ″.20, ″.07, ″.03.

No. 1924.

Marks, 7–823.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0370 in 6 inches.
Estimated temperature, 1024° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
5,000	10,000	.0037	.....	
10,000	20,000	.0063	.....	
15,000	30,000	.0093	.....	
16,000	32,000	.0100	.....	
17,000	34,000	.0111	.....	
18,000	36,000	.0121	.....	Elastic limit.
19,000	38,000	.0136	.....	
20,000	40,000	.0155	.....	
21,000	42,000	.0185	.....	
22,000	44,000	.0216	.....	
23,000	46,000	.0259	.....	
24,000	48,000	.0312	.....	
25,000	50,000	.0371	.....	
26,000	52,000	.0439	.....	
27,000	54,000	.0514	.....	
28,000	56,000	.0596	.....	
29,000	58,000	.0697	.....	
30,000	60,000	.0806	.....	
31,000	62,000	.0913	.....	
32,000	64,000	.1032	.....	
33,000	66,000	.1207	.....	
34,000	68,000	.1415	.....	
34,770	69,540	.2082	.....	Tensile strength.
29,500	83,360	.....	.....	At time of fracture.
0	0	.79	.....	= 15.8 per cent.

Fractured 2″.40 from neck. Appearance, silky. Surface of fracture and stem, blue-black.

Local contraction, 1″.2 each side of fracture.

Diameter at fracture, ″.56. Area, .246 square inch. Contraction, 50.8 per cent.

Elongation of inch sections, ″.06, ″.37*, ″.27, ″.07, ″.02.

No. 1921.

Marks, 7–823.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0422 in 6 inches.
Estimated temperature, 1158° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
5,000	10,000	.0037	.....	
10,000	20,000	.0078	.....	
11,000	22,000	.0088	.....	
12,000	24,000	.0099	.....	
13,000	26,000	.0110	.....	
14,000	28,000	.0126	.....	
15,000	30,000	.0141	.....	Elastic limit.
16,000	32,000	.0166	.....	
17,000	34,000	.0199	.....	
18,000	36,000	.0237	.....	
19,000	38,000	.0299	.....	
20,000	40,000	.0362	.....	
21,000	42,000	.0434	.....	
22,000	44,000	.0518	.....	
23,000	46,000	.0632	.....	
24,000	48,000	.0771	.....	
25,000	50,000	.0920	.....	
26,000	52,000	.1096	.....	
27,000	54,000	.1278	.....	
28,000	56,000	.1508	.....	
29,000	58,000	.2414	.....	
29,300	58,600	.3334	.....	Tensile strength.
14,600	68,680	.....	.....	At time of fracture.
0	0	1.08	.....	= 20.6 per cent.

Fractured 2″.40 from neck. Appearance, silky, spongy; dark-blue color. Surface of stem, blue black.

Local contraction, 1″.3 each side of fracture.

Diameter at fracture, ″.51. Area, .204 square inch. Contraction, 59.2 per cent.

Elongation of inch sections, ″.05, ″.10, ″.13, ″.08*, ″.07.

No. 1926.

Marks, 7–823.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0485 in 6 inches.
Estimated temperature, 1320° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
5,000	10,000	.0045	.....	
6,000	12,000	.0055	.....	
7,000	14,000	.0064	.....	
8,000	16,000	.0077	.....	
9,000	18,000	.0091	.....	
10,000	20,000	.0106	.....	Elastic limit.
11,000	22,000	.0133	.....	
12,000	24,000	.0162	.....	
13,000	26,000	.0206	.....	
14,000	28,000	.0272	.....	
15,000	30,000	.0390	.....	
16,000	32,000	.0542	.....	
16,500	33,000	.0671	.....	
17,000	34,000	.0823	.....	
17,500	35,000	.1285	.....	
17,520	35,040	.1570	.....	Tensile strength.
1,800	12,950	.....	.....	At time of fracture.
0	0	1.08	.....	=21.6 per cent.

Fractured 1″ from the neck. Appearance, silky, spongy. Both fractured ends concave. Surface of fracture and stem, dark blue.

Local contraction extends to the neck and 1″.3 from the fracture.

Diameter at fracture, ″.42. Area, .139 square inch. Contraction, 72.2 per cent.

Elongation of inch sections, ″.66*, ″.15, ″.13, ″.12, ″.10.

No. 1925.

Marks, 7–823. Diameter, ″.798. Sectional area, .50 square inch. Expansion, ″.0556 in 6 inches. Estimated temperature, 1503° Fahr. Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	2,000	0.	0.	
.....	.....	.....	.....	No apparent elastic limit.
.....	.....	.0004	.....	After 1 minute.
.....	.....	.0009	.....	After 2 minutes.
.....	.....	.0013	.....	After 3 minutes.
.....	.....	.0015	.....	After 4 minutes.
.....	.....	.0017	.....	After 5 minutes.
.....	.....	.0020	.....	After 6 minutes.
1,500	3,000	.0029	.....	
.....	.....	.0032	.....	After 1 minute.
.....	.....	.0034	.....	After 2 minutes.
.....	.....	.0036	.....	After 3 minutes.
.....	.....	.0038	.....	After 4 minutes.
.....	.....	.0041	.....	After 5 minutes.
2,000	4,000	.0049	.....	
.....	.....	.0054	.....	After 1 minute.
.....	.....	.0056	.....	After 2 minutes.
.....	.....	.0059	.....	After 3 minutes.
.....	.....	.0062	.....	After 4 minutes.
.....	.....	.0064	.....	After 5 minutes.
2,500	5,000	.0070	.....	
.....	.....	.0076	.....	After 1 minute.
.....	.....	.0080	.....	After 2 minutes.
.....	.....	.0082	.....	After 3 minutes.
.....	.....	.0086	.....	After 4 minutes.
.....	.....	.0088	.....	After 5 minutes.
3,000	6,000	.0095	.....	
4,000	8,000	.0107	.....	
.....	.....	.0125	.....	After 1 minute.
.....	.....	.0135	.....	After 2 minutes.
.....	.....	.0144	.....	After 3 minutes.
.....	.....	.0151	.....	After 4 minutes.
.....	.....	.0158	.....	After 5 minutes.
5,000	10,000	.0170	.....	
.....	.....	.0189	.....	After 1 minute.
.....	.....	.0207	.....	After 2 minutes.
.....	.....	.0217	.....	After 3 minutes.
.....	.....	.0232	.....	After 4 minutes.
.....	.....	.0243	.....	After 5 minutes.
6,000	12,000	.0261	.....	
7,000	14,000	.0284	.....	
.....	.....	.0350	.....	After 1 minute.
.....	.....	.0417	.....	After 2 minutes.
7,000	14,000	.0487	.....	After 3 minutes.
.....	.....	.0542	.....	After 4 minutes.
.....	.....	.0602	.....	After 5 minutes.
8,000	16,000	.0639	.....	
9,000	18,000	.0711	.....	
10,000	20,000	.0938	.....	
11,000	22,000	.1227	.....	Tensile strength.
11,000	.....	.1712	.....	After ½ minute.
.....	.....	.2232	.....	After 1 minute.
.....	.....	.2792	.....	After 1½ minutes.
.....	.....	.3492	.....	After 2 minutes.
0	0	1.31	.....	=26.2 per cent.

Fractured 2″.90 from neck. Appearance, silky, spongy. Both fract-
u ends concave. Surfaces of fracture and stem, blue black.
cal contraction, 1″.6 each side of fracture. Diameter at fracture,
″ Area, .075 square inch. Contraction, 85.0 per cent.
ngation of inch sections, ″.04, ″.26, ″.87*, ″.11, ″.03.
ile the elongation of the specimen was rapidly going on under
1 ,00 pounds tension, and the bar evidently would have ruptured
u ler this load within a short time, the stretching was suddenly in-
c sed by accelerating the movement of the piston of the testing ma-
c e, which temporarily increased the tensile stress to 14,000 pounds
t after which the load began to drop and rupture soon occurred.

No. 1922.

Marks, 7–823.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0604 in 6 inches.
Estimated temperature, 1627° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
1,500	3,000	.0018	.....	No apparent elastic limit.
2,000	4,000	.0040	.....	
2,500	5,000	.0067	.....	
3,000	6,000	.0106	.....	
3,500	7,000	.0172	.....	
4,000	8,000	.0251	.....	
4,500	9,000	.0418	.....	
5,000	10,000	.0586	.....	
5,500	11,000	.0983	.....	
6,000	12,000	.2349	.....	
6,020	12,040	.3159	.....	Tensile strength.
0	0	1.71	.....	= 34.2 per cent.

Fractured 3″.25 from neck. Appearance, silky, spongy. Both fractured ends concave and contain cavities ″.10 deep.

Surfaces of fracture and stem, blue black.

Local contraction, 2″.5 each side of fracture.

Diameter at fracture, ″.13. Area, .013 square inch. Contraction, 97.4 per cent.

Elongation of inch sections, ″.03, ″.23, 1″.29*, ″.13, ″.03.

No. 1777.

Marks, 8–750. Diameter, ″.798. Sectional area, .50 square inch. Temperature, 10° Fahr. Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
5,000	10,000	.0017	.....	
10,000	20,000	.0034	.....	
15,000	30,000	.0041	.....	
20,000	40,000	.0062	.....	
25,000	50,000	.0082	.....	
30,000	60,000	.0094	.....	
35,000	70,000	.0113	.....	
36,000	72,000	.0116	.....	
37,000	74,000	.0122	.....	Elastic limit.
37,500	75,000	.0133	.....	
38,000	76,000	.0154	.....	
38,500	77,000	.0185	.....	
39,000	78,000	.0207	.....	
39,500	79,000	.0225	.....	
40,000	80,000	.0247	.....	
42,000	84,000	.0317	.....	
44,000	88,000	.0386	.....	
46,000	92,000	.0462	.....	
48,000	96,000	.0542	.....	
50,000	100,000	.0624	.....	
52,000	104,000	.0719	.....	
54,000	108,000	.0810	.....	
56,000	112,000	.0910	.....	
58,000	116,000	.1024	.....	
60,000	120,000	.1129	.....	
62,000	124,000	.13	.....	
64,000	128,000	.145	.....	
66,000	132,000	.155	.....	
68,000	136,000	.165	.....	
70,000	140,000	.185	.....	
72,000	144,000	.21	.....	
74,000	148,000	.245	.....	
75,000	150,000	.27	.....	
76,000	152,000	.31	.....	
76,750	153,500	.....	.....	Tensile strength.
Fractured under the maximum load.				
0	0	.35	.....	=7.0 per cent.

Fractured 1″.50 from neck. Appearance, granular, radiating from an eccentric point.

Local contraction, inappreciable.

Diameter at fracture, ″.77. Area, .466 square inch. Contraction, 6.8 per cent.

Elongation of inch sections, ″.05, ″.06, ″.07, ″.11*, ″.06.

No. 1946.

Marks, 8–750. Diameter, ″.798. Sectional area, .50 square inch. Temperature, 70° Fahr.

Tensile strength, 75,800 pounds = 151,600 pounds per square inch.

ad rapidly applied. Time of reaching the maximum load about 4 onds.

e bar fractured under nearly the maximum load, ″.70 from neck.

A earance, granular, radiating from a point in the circumference.

cal contraction, ″.7 each side of fracture.

ameter at fracture, ″.75. Area, .442 square inch. Contraction, 1 per cent.

ngation in 5 inches, ″.40 = 8.0 per cent.

ngation of inch sections, ″.07, ″.08, ″.07, ″.08, ″.10*.

No. 1814.

Marks, 8–750.
Diameter, ″.798.
Sectional area, .50 square inch.
Temperature, 70° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
5,000	10,000	.0014	.....	
10,000	20,000	.0031	.....	
15,000	30,000	.0046	.....	
20,000	40,000	.0064	.....	
25,000	50,000	.0081	.....	
30,000	60,000	.0099	.....	
35,000	70,000	.0118	.....	
36,000	72,000	.0127	.....	Elastic limit.
36,500	73,000	.0138	.....	
37,000	74,000	.0170	.....	
38,000	76,000	.0222	.....	
39,000	78,000	.0260	.....	
40,000	80,000	.0292	.....	
42,000	84,000	.0364	.....	
44,000	88,000	.0444	.....	
46,000	92,000	.0527	.....	
48,000	96,000	.0610	.....	
50,000	100,000	.0702	.....	
52,000	104,000	.0797	.....	
54,000	108,000	.0902	.....	
56,000	112,000	.1009	.....	
58,000	116,000	.1126	.....	
60,000	120,000	.1260	.....	
62,000	124,000	.135	.....	
64,000	128,000	.15	.....	
66,000	132,000	.17	.....	
68,000	136,000	.20	.....	
70,000	140,000	.22	.....	
72,000	144,000	.25	.....	
74,000	148,000	.32	.....	
75,300	150,600	.....	.....	Tensile strength.
Fractured under the maximum load.				
0	0	.38	.....	=7.6 per cent.

Fractured 1″.20 from neck. Appearance, granular, radiating fr point in the circumference.

Diameter at fracture, ″.76. Area, .454 square inch. Contrac 9.2 per cent.

Elongation of inch sections, ″.07, ″.12*, ″.07, ″.07, ″.05.

No. 1801.

Marks, 8–750. Diameter, ″.798. Sectional area, .50 square inch. Expansion, ″.0064 in 6 inches. Estimated temperature, 242° Fahr. Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
5,000	10,000	.0013	.....	
10,000	20,000	.0029	.....	
15,000	30,000	.0041	.....	
20,000	40,000	.0068	.....	
25,000	50,000	.0087	.....	
30,000	60,000	.0103	.....	
33,000	66,000	.0117	.....	
33,500	67,000	.0119	.....	
34,000	68,000	.0123	.....	
34,500	69,000	.0126	.....	
35,000	70,000	.0131	.....	Elastic limit.
35,500	71,000	.0153	.....	
36,000	72,000	.0190	.....	
36,500	73,000	.0206	.....	
37,000	74,000	.0227	.....	
38,000	76,000	.0267	.....	
39,000	78,000	.0308	.....	
40,000	80,000	.0333	.....	
42,000	84,000	.0413	.....	
44,000	88,000	.0502	.....	
46,000	92,000	.0588	.....	
48,000	96,000	.0658	.....	
50,000	100,000	.0742	.....	
52,000	104,000	.0864	.....	
54,000	108,000	.0977	.....	
56,000	112,000	.11	.....	
58,000	116,000	.12	.....	
60,000	120,000	.145	.....	
63,000	126,000	.155	.....	
64,000	128,000	.175	.....	
65,000	130,000	.18	.....	
66,000	132,000	.19	.....	
67,000	134,000	.205	.....	
68,000	136,000	.225	.....	
69,000	138,000	.24	.....	
70,000	140,000	.26	.....	
71,000	142,000	.30	.....	
71,850	143,700	.40	.....	Tensile strength.
0	0	.36	.....	=7.2 per cent.

Fractured 2″.25 from neck. Appearance, granular, radiating from a center punch-mark in circumference. No change in color.

Local contraction not appreciable.

Diameter at fracture, ″.75. Area, .442 sq. in. Contraction, 11.6 per ct.

Elongation of inch sections, ″.04, ″.06, ″.10*, ″.11*, ″.05.

No. 1945.

Marks, 8–750. Diameter ″.798. Sectional area, .50 square inch. Expansion, ″.0075 in 6 inches.

Estimated temperature, 271° Fahr.

Tensile strength, 70,600 pounds = 141,200 pounds per square inch.

Load rapidly applied. Time of reaching the maximum load, about seconds.

The bar fractured under nearly the maximum load 1″ from the ck. Appearance, granular, radiating from a dull spot near the cirnference. No change in color.

Local contraction extends to the neck and 1″ from the fracture.

Diameter at fracture, ″.74. Area, .430 sq. in. Contraction, 14.0 per ct.

Elongation in 5 inches, ″.37=7.4 per cent.

Elongation of inch sections, ″.04, ″.03, ″.07, ″.11, ″.12*.

No. 1933.

Marks, 8–750.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0115 in 6 inches.
Estimated temperature, 378° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
30,000	60,000	.0067	.....	
31,000	62,000	.0069	.....	
32,000	64,000	.0074	.....	
33,000	66,000	.0080	.....	
34,000	68,000	.0085	.....	Elastic limit.
35,000	70,000	.0101	.....	
36,000	72,000	.0117	.....	
37,000	74,000	.0132	.....	
38,000	76,000	.0145	.....	
39,000	78,000	.0165	.....	
40,000	80,000	.0185	.....	
42,000	84,000	.0224	.....	
44,000	88,000	.0272	.....	
46,000	92,000	.0322	.....	
48,000	96,000	.0373	.....	
50,000	100,000	.0441	.....	
52,000	104,000	.0519	.....	
54,000	108,000	.0604	.....	
56,000	112,000	.0701	.....	
58,000	116,000	.0804	.....	
60,000	120,000	.0924	.....	
62,000	124,000	.1022	.....	
64,000	128,000	.1126	.....	
66,000	132,000	.1256	.....	
68,000	136,000	.1406	.....	
70,000	140,000	.1616	.....	
72,000	144,000	.1896	.....	
74,000	148,000	.2236	.....	
74,600	149,200	.2506	.....	Tensile strength.
0	0	.26	.....	=5.2 per cent.

Fractured ″.65 from neck. Appearance, granular, radiating from a dull spot at the center. No change in color. Surface of stem, straw color.

Local contraction, ″.6 each side of fracture.

Diameter at fracture, ″.76. Area, .454 square inch. Contraction, 9.2 per cent.

Elongation of inch sections, ″.02, ″.03, ″.04, ″.05, ″.12*.

No. 1803.

Marks, 8–750.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0165 in 6 inches.
Estimated temperature, 512° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	
5,000	10,000	.0022	.....	
10,000	20,000	.0046	.....	
15,000	30,000	.0057	.....	
20,000	40,000	.0079	.....	
25,000	50,000	.0097	.....	
26,000	52,000	.0101	.....	
27,000	54,000	.0107	.....	
28,000	56,000	.0111	.....	
29,000	58,000	.0116	.....	Elastic limit.
30,000	60,000	.0126	.....	
31,000	62,000	.0138	.....	
32,000	64,000	.0150	.....	
32,500	65,000	.0157	.....	
33,000	66,000	.0164	.....	
33,500	67,000	.0171	.....	
34,000	68,000	.0183	.....	
35,000	70,000	.0198	.....	
36,000	72,000	.0217	.....	
37,000	74,000	.0237	.....	
38,000	76,000	.0258	.....	
39,000	78,000	.0278	.....	
40,000	80,000	.0299	.....	
42,000	84,000	.0345	.....	
44,000	88,000	.0409	.....	
46,000	92,000	.0472	.....	
50,000	100,000	.0601	.....	
54,000	108,000	.0747	.....	
58,000	116,000	.0941	.....	
62,000	124,000	.11	.....	
66,000	132,000	.12	.....	
70,000	140,000	.15	.....	
72,000	144,000	.17	.....	
74,000	148,000	.19	.....	
76,000	152,000	.215	.....	
78,000	156,000	.245	.....	
80,000	160,000	.31	.....	
81,750	163,500	.395	.....	Tensile strength.
Fractured under the maximum load.				
0	0	.38	.....	= 7.6 per cent.

Fractured ″.60 from neck. Appearance, granular, radiating from an eccentric spot. Surface of fracture, slightly browned. Surface of stem, light blue, changing to purple near the place of rupture.

Local contraction not appreciable.

Diameter at fracture, ″.76. Area, .454 square inch. Contraction, 9.2 per cent.

Elongation of inch sections, ″.06, ″.08, ″.08, ″.07, ″.09*.

No. 1936.

Marks, 8–750.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0176 in 6 inches.
Estimated temperature, 542° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
5,000	10,000	.0089	.....	
10,000	20,000	.0104	.....	
15,000	30,000	.0108	.....	
20,000	40,000	.0127	.....	
25,000	50,000	.0142	.....	
26,000	52,000	.0147	.....	
27,000	54,000	.0153	.....	
28,000	56,000	.0159	.....	
29,000	58,000	.0166	.....	Elastic limit.
30,000	60,000	.0176	.....	
31,000	62,000	.0185	.....	
32,000	64,000	.0199	.....	
33,000	66,000	.0213	.....	
34,000	68,000	.0228	.....	
35,000	70,000	.0246	.....	
36,000	72,000	.0263	.....	
37,000	74,000	.0284	.....	
38,000	76,000	.0306	.....	
40,000	80,000	.0348	.....	
42,000	84,000	.0407	.....	
44,000	88,000	.0468	.....	
46,000	92,000	.0537	.....	
48,000	96,000	.0597	.....	
50,000	100,000	.0671	.....	
52,000	104,000	.0746	.....	
54,000	108,000	.0829	.....	
56,000	112,000	.0923	.....	
58,000	116,000	.1011	.....	
60,000	120,000	.1103	.....	
62,000	124,000	.1174	.....	
64,000	128,000	.1278	.....	
66,000	132,000	.1388	.....	
68,000	136,000	.1533	.....	
70,000	140,000	.1675	.....	
72,000	144,000	.185	.....	
74,000	148,000	.21	.....	
76,000	152,000	.235	.....	
78,000	156,000	.295	.....	
80,000	160,000	.34	.....	
81,750	163,500	.49	.....	Tensile strength.
81,000	183,260	.....	.....	At time of fracture.
0	0	.56	.....	=11.2 per cent.

Fractured at middle of stem. Appearance, granular, radiating from a point in the circumference. Dark-brown color. Surface of stem, blue with purple cast.

Local contraction inappreciable.

Diameter at fracture, ″.75. Area, .442 square inch. Contrac , 11.6 per cent.

Elongation of inch sections, ″.09, ″.13, ″.15*, ″.11, ″.08.

No. 1944.

Marks, S–750.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0192 in 6 inches.
Estimated temperature, 585° Fahr.
Tensile strength, 78,500 pounds=157,000 pounds per square inch.
Load applied rapidly; time of reaching the maximum load, about 4 seconds.
The bar fractured under nearly the maximum load 1″.3 from neck. Appearance, granular, radiating from a spot near the center. Dark-brown color, with bronze hue. Surface of stem, blue.
Local contraction not appreciable.
Diameter at fracture, ″.76. Area, .454 square inch. Contraction, 9.2 per cent.
Elongation in 5 inches, ″.38=7.6 per cent.
Elongation of inch sections, ″.06, ″.12*, ″.07, ″.07, ″.06.

No. 1802.

Marks, 8–750.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0216 in 6 inches.
Estimated temperature, 649° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Init al load.
5,000	10,000	.0024	.....	
10,000	20,000	.0036	.....	
15,000	30,000	.0045	.....	
20,000	40,000	.0065	.....	
25,000	50,000	.0096	.....	
30,000	60,000	.0138	.....	
30,500	61,000	.0146	.....	
31,000	62,000	.0153	.....	
31,500	63,000	.0160	.....	Elastic limit.
32,000	64,000	.0169	.....	
32,500	65,000	.0178	.....	
33,000	66,000	.0187	.....	
34,000	68,000	.0209	.....	
35,000	70,000	.0230	.....	
36,000	72,000	.0253	.....	
37,000	74,000	.0280	.....	
38,000	76,000	.0293	.....	
39,000	78,000	.0324	.....	
40,000	80,000	.0359	.....	
42,000	84,000	.0426	.....	
44,000	88,000	.0498	.....	
46,000	92,000	.0574	.....	
48,000	96,000	.0649	.....	
50,000	100,000	.0733	.....	
52,000	104,000	.0823	.....	
54,000	108,000	.0913	.....	
56,000	112,000	.1015	.....	
58,000	116,000	.1123	.....	
60,000	120,000	.125	.....	
62,000	124,000	.135	.....	
64,000	128,000	.15	.....	
66,000	132,000	.17	.....	
68,000	136,000	.185	.....	
70,000	140,000	.22	.....	
71,000	142,000	.245	.....	
72,000	144,000	.285	.....	
73,000	146,000	.315	.....	
74,000	148,000	.34	.....	
75,000	150,000	.43	.....	Tensile strength.
72,600	173,270	.....	.....	At time of fracture.
0	0	.51	.....	=10.2 per cent.

Fractured 1″.15 from neck, at center punch mark. Appearance, silky at center and at the circumference, with intermediate ring of granular metal.

Surface of fracture, medium blue color. Surface of stem, brown, checkered with blue-black spots.

Local contraction, 1″ each side of fracture.

Diameter at fracture, ″.73. Area, .419 square inch. Contraction 16.2 per cent.

Elongation of inch sections, ″.15*, ″.16*, ″.10, ″.06, ″.04.

No. 1935.

Marks, 8–750.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0243 in 6 inches.
Estimated temperature, 720° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
20,000	40,000	.0050	.....	
25,000	50,000	.0071	.....	
26,000	52,000	.0077	.....	
27,000	54,000	.0087	.....	
28,000	56,000	.0092	.....	Elastic limit.
29,000	58,000	.0103	.....	
30,000	60,000	.0116	.....	
31,000	62,000	.0129	.....	
32,000	64,000	.0145	.....	
33,000	66,000	.0163	.....	
34,000	68,000	.0183	.....	
36,000	72,000	.0231	.....	
38,000	76,000	.0284	.....	
40,000	80,000	.0344	.....	
42,000	84,000	.0414	.....	
44,000	88,000	.0487	.....	
46,000	92,000	.0562	.....	
48,000	96,000	.0640	.....	
50,000	100,000	.0736	.....	
52,000	104,000	.0831	.....	
54,000	108,000	.0926	.....	
56,000	112,000	.1029	.....	
58,000	116,000	.1151	.....	
60,000	120,000	.1271	.....	
62,000	124,000	.1429	.....	
64,000	128,000	.1608	.....	
66,000	132,000	.1833	.....	
68,000	136,000	.215	.....	
70,000	140,000	.27	.....	
70,580	141,160	.33	.....	Tensile strength.
59,600	164,190	.....	.....	At time of fracture.
0	0	.62	.....	= 12.4 per cent.

Fractured 1″.80 from neck. Appearance, silky; deep blue color. Surface of stem, blue black with bronze-colored tinge.

Local contraction, ″.8 each side of fracture.

Diameter at fracture, ″.68. Area, .363 square inch. Contraction, 27.4 per cent.

Elongation of inch sections, ″.11, ″.29*, ″.11, ″.06, ″.05.

No. 1804.

Marks, 8–750. Diameter, ″.798. Sectional area, .50 square inch. Expansion, ″.0261 in 6 inches. Estimated temperature, 768° Fahr. Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
5,000	10,000	.0016	.....	
10,000	20,000	.0038	.....	
15,000	30,000	.0050	.....	
20,000	40,000	.0074	.....	
21,000	42,000	.0080	.....	
22,000	44,000	.0084	.....	
23,000	46,000	.0088	.....	
24,000	48,000	.0092	.....	
25,000	50,000	.0101	.....	
26,000	52,000	.0110	.....	
27,000	54,000	.0114	.....	Elastic limit.
28,000	56,000	.0124	.....	
29,000	58,000	.0135	.....	
30,000	60,000	.0146	.....	
32,000	64,000	.0178	.....	
34,000	68,000	.0222	.....	
36,000	72,000	.0265	.....	
38,000	76,000	.0321	.....	
40,000	80,000	.0372	.....	
42,000	84,000	.0446	.....	
44,000	88,000	.0523	.....	
46,000	92,000	.0604	.....	
48,000	96,000	.0684	.....	
50,000	100,000	.0773	.....	
52,000	104,000	.0862	.....	
54,000	108,000	.0973	.....	
56,000	112,000	.1090	.....	
58,000	116,000	.1228	.....	
60,000	120,000	.135	.....	
62,000	124,000	.155	.....	
64,000	128,000	.175	.....	
66,000	132,000	.205	.....	
68,000	136,000	.235	.....	
68,680	137,360	.335	.....	Tensile strength.
58,800	161,980	.....	.....	At time of fracture.
0	0	.63	.....	=12.6 per cent.

Fractured 1″.10 from neck. Appearance, silky. Surface of stem and fracture, blue black.

Local contraction, ″.9 each side of fracture.

Diameter at fracture, ″.68. Area, .363 sq. in. Contraction, 27.4 p. ct.

Elongation of inch sections, ″.05, ″.08, ″.11, ″.18, ″.21*.

No. 1943.

Marks, 8–750.

Diameter, ″.798.

Sectional area, .50 square inch.

Expansion, ″.0278 in 6 inches.

Estimated temperature, 815° Fahr.

Tensile strength, 70,500 pounds = 141,000 pounds per square inch.

Fractured rapidly; time of reaching the maximum load about seconds, rupture occurring about 12 seconds later, the load falling the meantime.

Elongation in 5 inches, ″.80 = 16.0 per cent.

Fractured ″.95 from neck. Appearance, silky; light greenish-b color. Surface of stem, brown, with small spots of blue black color

Local contraction, ″.9 each side of fracture.

Diameter at fracture, ″.66. Area, .342 square inch. Contraction, 3 per cent.

Elongation of inch sections, ″.11, ″.13, ″.13, ″.17, ″.26*.

No. 1805.

Marks, 8–750.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0308 in 6 inches.
Estimated temperature, 896° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
5,000	10,000	.0028	.....	
10,000	20,000	.0052	.....	
15,000	30,000	.0069	.....	
20,000	40,000	.0101	.....	
21,000	42,000	.0107	.....	
22,000	44,000	.0114	.....	Elastic limit.
23,000	46,000	.0124	.....	
24,000	48,000	.0132	.....	
25,000	50,000	.0143	.....	
26,000	52,000	.0156	.....	
27,000	54,000	.0171	.....	
28,000	56,000	.0184	.....	
29,000	58,000	.0205	.....	
30,000	60,000	.0227	.....	
32,000	64,000	.0281	.....	
34,000	68,000	.0347	.....	
36,000	72,000	.0433	.....	
38,000	76,000	.0505	.....	
40,000	80,000	.0591	.....	
42,000	84,000	.0683	.....	
44,000	88,000	.0798	.....	
46,000	92,000	.0929	.....	
48,000	96,000	.1049	.....	
50,000	100,000	.1200	.....	
52,000	104,000	.145	.....	
53,000	106,000	.165	.....	
54,000	108,000	.175	.....	
55,000	110,000	.19	.....	
56,000	112,000	.21	.....	
57,000	114,000	.235	.....	
57,940	115,880	.30	.....	Tensile strength.
42,900	125,440	.....	.....	At time of fracture.
0	0	.85	.....	= 17.0 per cent.

Fractured at middle of stem. Appearance, silky; greenish-blue color Surface of stem, blue black.

Local contraction, 1″ each side of fracture.

Diameter at fracture, ″.66. Area, .342 square inch. Contraction, 13.6 per cent.

Elongation of inch sections, ″.08, ″.16, ″.37*, ″.16, ″.08.

No. 1932.

Mark, 8–750.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0359 in 6 inches.
Estimated temperature, 1032° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
5,000	10,000	.0020	.....	
10,000	20,000	.0040	.....	
15,000	30,000	.0053	.....	
16,000	32,000	.0060	.....	
17,000	34,000	.0067	.....	
18,000	36,000	.0075	.....	
19,000	38,000	.0081	.....	
20,000	40,000	.0091	.....	
21,000	42,000	.0098	.....	
22,000	44,000	.0109	.....	Elastic limit.
23,000	46,000	.0123	.....	
24,000	48,000	.0137	.....	
25,000	50,000	.0158	.....	
26,000	52,000	.0177	.....	
27,000	54,000	.0206	.....	
28,000	56,000	.0236	.....	
29,000	58,000	.0269	.....	
30,000	60,000	.0318	.....	
32,000	64,000	.0401	.....	
34,000	68,000	.0481	.....	
36,000	72,000	.0610	.....	
38,000	76,000	.0728	.....	
40,000	80,000	.0891	.....	
42,000	84,000	.1038	.....	
44,000	88,000	.1300	.....	
45,000	90,000	.1491	.....	
46,000	92,000	.1681	.....	
47,000	94,000	.2166	.....	
47,100	94,200	.235	.....	Tensile strength.
37,100	99,200	.....	.....	At time of fracture.
0	0	.55	.....	=11.0 per cent.

Fractured 2″.25 from neck. Appearance, silky, spongy; light blue, with olive tinge. Surface of stem, blue black.
Local contraction, 1″.1 each side of fracture.
Diameter at fracture, ″.69. Area, .374 sq. in. Contraction, 25.2 p. ct.
Elongation of inch sections, ″.03, ″.06, ″.18, ″.23*, ″.05.

No. 1942.

Marks, 8–750.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0392 in 6 inches.
Estimated temperature, 1121° Fahr.
Tensile strength, 48,000 pounds = 96,000 pounds per square inch.
Time between application of load and when tensile strength was reached, 3 seconds. The load then suddenly fell, and rupture was completed in about one-half minute.
Elongation in 5 inches, ″.80 = 16.0 per cent.
Fractured 2″.65 from neck. Appearance, silky, spongy; dark-greenish color. Surface of stem, blue black.
Local contraction, 1″.1 each side of fracture.
Diameter at fracture, ″.64. Area, .322 sq. in. Contraction, 35.6 p. ct.
Elongation of inch sections, ″.07, ″.18, ″.38*, ″.12, ″.05.

No. 1941.

Marks, 8–750.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0412 in 6 inches.
Estimated temperature, 1174° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
5,000	10,000	.0026	.....	
10,000	20,000	.0063	.....	
11,000	22,000	.0073	.....	
12,000	24,000	.0079	.....	
13,000	26,000	.0086	.....	
14,000	28,000	.0096	.....	
15,000	30,000	.0103	.....	
16,000	32,000	.0116	.....	Elastic limit.
17,000	34,000	.0140	.....	
18,000	36,000	.0151	.....	
19,000	38,000	.0171	.....	
20,000	40,000	.0197	.....	
21,000	42,000	.0227	.....	
22,000	44,000	.0269	.....	
24,000	48,000	.0319	.....	
26,000	52,000	.0407	.....	
28,000	56,000	.0551	.....	
30,000	60,000	.0721	.....	
32,000	64,000	.0989	.....	
34,000	68,000	.1517	.....	
34,160	68,320	.1866	.....	Tensile strength.
27,200	70,650	.....	.....	At time of fracture.
0	0	.67	.....	=13.4 per cent.

Fractured 2″.55 from neck. Appearance, silky, spongy. Surface of fracture and stem, blue black.

Local contraction, 1″ each side of fracture.

Diameter at fracture, ″.70. Area, .385 square inch. Contraction, 23.0 per cent.

Elongation of inch sections, ″.05, ″.11, ″.27*, ″.18, ″.06.

No. 1806.

Marks, 8–750.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0436 in 6 inches.
Estimated temperature, 1239° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
5,000	10,000	.0038	.....	
10,000	20,000	.0092	.....	
11,000	22,000	.0102	.....	
12,000	24,000	.0116	.....	
13,000	26,000	.0126	.....	Elastic limit.
14,000	28,000	.0140	.....	
15,000	30,000	.0160	.....	
16,000	32,000	.0183	.....	
17,000	34,000	.0210	.....	
18,000	36,000	.0248	.....	
19,000	38,000	.0299	.....	
20,000	40,000	.0343	.....	
21,000	42,000	.0420	.....	
22,000	44,000	.0524	.....	
23,000	46,000	.0655	.....	
24,000	48,000	.0799	.....	
25,000	50,000	.1128	.....	
25,800	51,600	.1467	.....	Tensile strength.
18,500	52,410	.....	.....	At time of fracture.
0	0	.35	.....	=7.0 per cent.

Fractured ″.70 from neck. Appearance, silky. Surface of fra
and stem, blue-black color.

Local contraction extends to the neck, and ″.9 from fracture.

Diameter at fracture, ″.67. Area, .353 square inch. Contra
29.4 per cent.

Elongation of inch sections, ″.01, ″.02, ″.02, ″.05, ″.25*.

No. 1940.

Marks, 8–750.
Diameter ″.798.
Sectional area .50 square inch.
Expansion ″.0500 in 6 inches.
Estimated temperature, 1410° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
2,000	4,000	.0024	.....	
3,000	6,000	.0046	.....	
4,000	8,000	.0061	.....	
5,000	10,000	.0072	.....	Probable elastic limit (not well defined).
6,000	12,000	.0092	.....	
7,000	14,000	.0112	.....	
8,000	16,000	.0131	.....	
9,000	18,000	.0155	.....	
10,000	20,000	.0182	.....	
11,000	22,000	.0224	.....	
12,000	24,000	.0282	.....	
13,000	26,000	.0358	.....	
14,000	28,000	.0463	.....	
15,000	30,000	.0571	.....	
16,000	32,000	.0815	.....	
16,620	33,240	.1162	.....	Tensile strength.
16,000	.....	.1665	.....	
15,000	.....	.2230	.....	
14,000	.....	.2708	.....	
12,000	.....	.37	.....	
3,500	17,160	.....	.....	At time of fracture.
0	0	.65	.....	= 12.8 per cent.

Fractured ″.75 from neck. Appearance, silky, spongy. Surface of fracture and stem, blue black.

Local contraction extends to the neck, and 1″.1 from the fracture.

Diameter at fracture, ″.51. Area, .204 square inch.

Contraction, 59.2 per cent.

Elongation of inch sections, ″.03, ″.02, ″.02, ″.06, ″.51*.

No. 1939.

Marks, 8–750.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0500 in 6 inches.
Estimated temperature, 1410° Fahr.
Tensile strength, 31,500 pounds=63,000 pounds per square inch.
Time of test, 2 seconds.
Elongation in 5 inches, ″.51=10.2 per cent.
Fractured 2″.2 from neck. Appearance, silky, spongy. Surface
fracture and stem, blue-black color.
Local contraction, 1″. each side of fracture.
Diameter at fracture, ″.69. Area, .374 square inch. Contractio
25.2 per cent.
Elongation of inch sections, ″.02, ″.05, ″.22*, ″.18*, ″.04.

No. 1938.

Marks, 8–750.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0554 in 6 inches.
Estimated temperature, 1555° Fahr.
Tensile strength, 21,000 pounds = 42,000 pounds per square inch.
Time of test, 5 seconds.
Elongation in 5 inches, ″.94 = 18.8 per cent.
Fractured 1″.15 from neck. Appearance, silky, spongy. Surface
fracture and stem, blue-black color.
Local contraction, 1″ each side of fracture.
Diameter at fracture, ″.63. Area, .312 square inch. Contracti
37.6 per cent.
Elongation of inch sections, ″.06, ″.12, ″.19, ″.27, ″.30*.

No. 1937.

Marks, 8–750.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0578 in 6 inches.
Estimated temperature, 1620° Fahr.
Tensile strength, 16,000 pounds=32,000 pounds per square inch.
Time of test, 5 seconds.
Elongation in 5 inches, ″.93=18.6 per cent.
Fractured 2″.75 from neck. Appearance, silky, spongy. Surface
fracture and stem, blue black.
Fractured ends open at one side ″.10. Local contraction, 1″
side of fracture.
Diameter at fracture, ″.46. Area, .166 square inch. Contr
66.8 per cent.
Elongation of inch sections, ″.01, ″.12, ″.71*, ″.07, ″.02.

No. 1934.

Marks, 8–750. Diameter, ″.798. Sectional area, .50 square inch. Expansion, ″.0586 in 6 inches. Estimated temperature, 1641° Fahr. Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inches.*
1,000	2,000	0.	0.	Initial load.
1,500	3,000	.0015	.....	No apparent elastic limit.
.....	.....	.0033	.....	After 1 minute.
2,000	4,000	.0050	.....	
.....	.....	.0069	.....	Do.
2,500	5,000	.0084	.....	
.....	.....	.0107	.....	Do.
3,000	6,000	.0118	.....	
.....	.....	.0149	.....	Do.
3,500	7,000	.0166	.....	
.....	.....	.0200	.....	Do.
4,000	8,000	.0216	.....	
.....	.....	.0262	.....	Do.
4,500	9,000	.0285	.....	
4,500	9,000	.0341	.....	Do.
5,000	10,000	.0366	.....	
.....	.....	.0446	.....	Do.
5,500	11,000	.0473	.....	
.....	.....	.0586	.....	Do.
6,000	12,000	.0626	.....	
.....	.....	.0779	.....	Do.
6,500	13,000	.0836	.....	
.....	.....	.1034	.....	Do.
7,000	14,000	.1101	.....	
.....	.....	.1360	.....	Do.
.....	.....	.1510	.....	After 1½ minutes.
.....	.....	.1640	.....	After 2 minutes.
.....	.....	.1760	.....	After 2½ minutes.
.....	.....	.1900	.....	After 3 minutes.
.....	.....	.2070	.....	After 3½ minutes.
.....	.....	.2225	.....	After 4 minutes.
.....	.....	.2385	.....	After 4½ minutes.
.....	.....	.2530	.....	After 5 minutes.
.....	.....	.2670	.....	After 5½ minutes.
.....	.....	.2830	.....	After 6 minutes.
.....	.....	.2985	.....	After 6½ minutes.
.....	.....	.3160	.....	After 7 minutes.
.....	.....	.3322	.....	After 7½ minutes.
.....	.....	.3485	.....	After 8 minutes.
.....	.....	.365	.....	After 8½ minutes.
.....	.....	.38	.....	After 9 minutes.
.....	.....	.40	.....	After 9½ minutes.
.....	.....	.42	.....	After 10 minutes.
.....	.....	.445	.....	After 10½ minutes.
.....	.....	.46	.....	After 11 minutes.
.....	.....	.48	.....	After 11½ minutes.
.....	.....	.50	.....	After 12 minutes.
.....	.....	.53	.....	After 12½ minutes.
.....	.....	.56	.....	After 13 minutes.
.....	.....	.59	.....	After 13½ minutes.
.....	.....	.62	.....	After 14 minutes.
.....	.....	.66	.....	After 14½ minutes.
.....	.....	.70	.....	After 15 minutes.
.....	.....	.75	.....	After 15½ minutes.
.....	.....	.84	.....	After 16 minutes.
.....	.....	.98	.....	After 16½ minutes.
7,000	14,000	.....	.....	Tensile strength.
Rate of elongation rapidly increased and load gradually fell, the metal separating when the load had fallen nearly to zero.				
0	0	1.55	.....	= 31.0 per cent.

Fractured 2″.90 from neck. Appearance, silky, spongy. Both fractured ends concave. Surface of fracture and stem, dark-blue color.
Local contraction, 1″.7 each side of fracture.
Diameter at fracture, ″.30. Area, .071 sq. in. Contraction, 85.8 per ct.
Elongation of inch sections, ″.07, ″.35, ″.97*, ″.13, ″.03.
Total time of test, 35 minutes.

No. 1778.

Marks, 9–756.
Diameter, ″.798.
Sectional area, .50 square inch.
Temperature, 10° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
5,000	10,000	.0024	.....	
10,000	20,000	.0044	.....	
15,000	30,000	.0061	.....	
20,000	40,000	.0079	.....	
25,000	50,000	.0098	.....	
30,000	60,000	.0110	.....	
35,000	70,000	.0124	.....	
40,000	80,000	.0149	.....	
41,500	83,000	.....	.....	Elastic limit.
42,000	84,000	.0314	.....	
43,000	86,000	.0341	.....	
44,000	88,000	.0378	.....	
46,000	92,000	.0463	.....	
48,000	96,000	.0537	.....	
50,000	100,000	.0613	.....	
52,000	104,000	.0698	.....	
54,000	108,000	.0792	.....	
56,000	112,000	.0890	.....	
58,000	116,000	.1005	.....	
60,000	120,000	.1087	.....	
62,000	124,000	.1212	.....	
64,000	128,000	.1309	.....	
66,000	132,000	.14	.....	
68,000	136,000	.155	.....	
70,000	140,000	.17	.....	
72,000	144,000	.19	.....	
74,000	148,000	.22	.....	
75,000	150,000	.24	.....	
76,000	152,000	.255	.....	
77,000	154,000	.28	.....	Tensile strength.
Fractured under the maximum load.				
0	0	.23	.....	=4.6 per cent.

Fractured 2″.25 from neck. Appearance, granular, flaky, radiating from a point in the circumference near the center-punch mark.

Local contraction inappreciable.

Diameter at fracture, ″.77. Area, .466 square inch. Contraction, 6.8 per cent.

Elongation of inch sections, ″.04, ″.04, ″.05*, ″.05, ″.05.

No. 1815.

Marks, 9–756.
Diameter, ″.798.
Sectional area, 50 square inch.
Temperature, 70° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
5,000	10,000	.0013	.....	
10,000	20,000	.0029	.....	
15,000	30,000	.0045	.....	
20,000	40,000	.0062	.....	
25,000	50,000	.0079	.....	
30,000	60,000	.0096	.....	
35,000	70,000	.0113	.....	
36,000	72,000	.0116	.....	
37,000	74,000	.0120	.....	
37,500	75,000	.0122	.....	
38,000	76,000	.0123	.....	
38,500	77,000	.0125	.....	
39,000	78,000	.0127	.....	
39,500	79,000	.0129	.....	
40,000	80,000	.0131	.....	
40,500	81,000	.0136	.....	Elastic limit.
41,000	82,000	.....	.....	Load reached and then fell to.
40,000	80,000	.0171	.....	
		.0186	.....	
41,000	82,000	.0276	.....	
42,000	84,000	.0307	.....	
44,000	88,000	.0380	.....	
46,000	92,000	.0454	.....	
48,000	96,000	.0538	.....	
50,000	100,000	.0625	.....	
52,000	104,000	.0712	.....	
54,000	108,000	.0804	.....	
56,000	112,000	.0905	.....	
58,000	116,000	.1012	.....	
60,000	120,000	.1122	.....	
62,000	124,000	.125	.....	
64,000	128,000	.14	.....	
66,000	132,000	.155	.....	
68,000	136,000	.165	.....	
70,000	140,000	.185	.....	
72,000	144,000	.215	.....	
74,000	148,000	.245	.....	
76,000	152,000	.305	.....	
77,300	154,600	.....	.....	Tensile strength.
Fractured under the maximum load.				
0	0	.33	.....	= 6.6 per cent.

Fractured 1″.09 from neck at center-punch mark. Appearance, granular, radiating from a center-punch mark in circumference.

Diameter at fracture, ″.76. Area, .454 square inch. Contraction, 9.2 per cent.

Elongation of inch sections, ″.04, ″.05, ″.07, ″.08, ″.09*.

No. 1816.

Marks, 9–756.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0084 in 6 inches.
Estimated temperature, 295° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
10,000	10,000	.0013	.....	
15,000	30,000	.0028	.....	
20,000	40,000	.0048	.....	
25,000	50,000	.0061	.....	
30,000	60,000	.0074	.....	
33,000	66,000	.0077	.....	
34,000	68,000	.0081	.....	
35,000	70,000	.0084	.....	
36,000	72,000	.0091	.....	Elastic limit.
37,000	74,000	.0122	.....	
38,000	76,000	.0201	.....	
39,000	78,000	.0209	.....	
40,000	80,000	.0225	.....	
41,000	82,000	.0242	.....	
42,000	84,000	.0328	.....	
43,000	86,000	.0374	.....	
44,000	88,000	.0412	.....	
45,000	90,000	.0419	.....	
46,000	92,000	.0425	.....	
47,000	94,000	.0444	.....	
48,000	96,000	.0495	.....	
49,000	98,000	.0545	.....	
50,000	100,000	.0634	.....	
52,000	104,000	.0696	.....	
54,000	108,000	.0884	.....	Throbs.
56,000	112,000	.1001	.....	
58,000	116,000	.1016	.....	
60,000	120,000	.1153	.....	
62,000	124,000	.1358	.....	
64,000	128,000	.14	.....	
66,000	132,000	.155	.....	Throbs.
68,000	136,000	.20	.....	
70,000	140,000	.225	.....	
72,000	144,000	.315	.....	
72,380	144,600	.36	.....	Tensile strength.
Fractured under the maximum load.				
0	0	.31	.....	= 6.2 per cent.

Fractured 1″.09 from neck at center-punch mark. Appearance, granular, radiating from center-punch mark in the circumference. Fractured surface not changed in color.

Surface of stem, pale straw color.

Local contraction, ″.8 each side of fracture.

Diameter at fracture, ″.75. Area, .442 square inch. Contraction, 11.6 per cent.

Elongation of inch sections, ″.04, ″.05, ″.05, ″.08*, ″.09*.

No. 1949.

Marks, 9–756.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0115 in 6 inches.
Estimated temperature, 377° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
10,000	20,000	.0049	.....	
15,000	30,000	.0071	.....	
20,000	40,000	.0092	.....	
25,000	50,000	.0111	.....	
26,000	52,000	.0117	.....	
27,000	54,000	.0123	.....	
28,000	56,000	.0128	.....	
29,000	58,000	.0132	.....	
30,000	60,000	.0137	.....	
31,000	62,000	.0142	.....	Elastic limit.
32,000	64,000	.0152	.....	
33,000	66,000	.0162	.....	
34,000	68,000	.0178	.....	
35,000	70,000	.0197	.....	
36,000	72,000	.0219	.....	
38,000	76,000	.0263	.....	
40,000	80,000	.0312	.....	
42,000	84,000	.0365	.....	
44,000	88,000	.0423	.....	
46,000	92,000	.0482	.....	
48,000	96,000	.0540	.....	
50,000	100,000	.0614	.....	
54,000	108,000	.0771	.....	
58,000	116,000	.0938	.....	
62,000	124,000	.1130	.....	
66,000	132,000	.1364	.....	
70,000	140,000	.155	.....	
72,000	144,000	.18	.....	
74,000	148,000	.21	.....	
76,000	152,000	.245	.....	
77,000	154,000	.27	.....	
78,000	156,000	.29	.....	
79,000	158,000	.33	.....	
79,600	159,200	.36	.....	Tensile strength.
Fractured under the maximum load.				
0	0	.28	.....	= 5.6 per cent.

Fractured 1″.06 from neck. Appearance, granular, radiating from center-punch mark in the circumference. No change in color.

Fractured surface contains a T-shaped seam ″.2 on a side. Surface of stem, straw colored.

Local contraction inappreciable.

Diameter at fracture, ″.77. Area, .466 square inch. Contraction, 8 per cent.

Elongation of inch sections, ″.04, ″.05, ″.06, ″.07*, ″.06*.

No. 1818.

Marks, 9–756.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0160 in 6 inches.
Estimated temperature, 498° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
5,000	10,000	.0012	.....	
10,000	20,000	.0027	.....	
15,000	30,000	.0049	.....	
20,000	40,000	.0070	.....	
25,000	50,000	.0090	.....	
26,000	52,000	.0093	.....	
27,000	54,000	.0098	.....	
28,000	56,000	.0104	.....	
29,000	58,000	.0111	.....	
30,000	60,000	.0117	.....	Elastic limit.
31,000	62,000	.0128	.....	
32,000	64,000	.0140	.....	
33,000	66,000	.0155	.....	
34,000	68,000	.0169	.....	
35,000	70,000	.0185	.....	
36,000	72,000	.0206	.....	
38,000	76,000	.0248	.....	
40,000	80,000	.0299	.....	
44,000	88,000	.0392	.....	
48,000	96,000	.0520	.....	
52,000	104,000	.0673	.....	
56,000	112,000	.0840	.....	
60,000	120,000	.1005	.....	
64,000	128,000	.1207	.....	
68,000	136,000	.155	.....	
70,000	140,000	.16	.....	
72,000	144,000	.18	.....	
74,000	148,000	.205	.....	
76,000	152,000	.22	.....	
78,000	156,000	.26	.....	
80,000	160,000	.32	.....	
81,000	162,000	.37	.....	
82,000	164,000	.47	.....	
82,100	164,200	.48	.....	Tensile strength.
81,000	162,000	.....	.....	At time of fracture.
0	0	.53	.....	= 10.6 per cent.

Fractured 2″ from the neck. Appearance, granular, radiating from a point in the circumference. Fractured surface, snuff-brown color. Surface of stem, brownish blue, mottled.

Local contraction not appreciable.

Diameter at fracture, ″.745. Area, .436 square inch. Contraction, 12.8 per cent.

Elongation of inch sections, ″.09, ″.15*, ″.13, ″.09, ″.07.

No. 1978.

Marks, 9–756.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0160 in 6 inches.
Estimated temperature, 498° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
5,000	10,000	.0030	.....	
10,000	20,000	.0050	.....	
15,000	30,000	.0070	.....	
20,000	40,000	.0091	.....	
25,000	50,000	.0111	.....	
26,000	52,000	.0115	.....	
27,000	54,000	.0121	.....	
28,000	56,000	.0125	.....	
29,000	58,000	.0129	.....	
30,000	60,000	.0136	.....	Elastic limit.
31,000	62,000	.0148	.....	
32,000	64,000	.0162	.....	
33,000	66,000	.0176	.....	
34,000	68,000	.0189	.....	
35,000	70,000	.0205	.....	
36,000	72,000	.0226	.....	
38,000	76,000	.0273	.....	
40,000	80,000	.0318	.....	
44,000	88,000	.0421	.....	
48,000	96,000	.0538	.....	
52,000	104,000	.0676	.....	
56,000	112,000	.0839	.....	
60,000	120,000	.1003	.....	
62,000	124,000	.1093	.....	
64,000	128,000	.1198	.....	
66,000	132,000	.1298	.....	
68,000	136,000	.1413	.....	
70,000	140,000	.1548	.....	
72,000	144,000	.1712	.....	
74,000	148,000	.1849	.....	
76,000	152,000	.2098	.....	
78,000	156,000	.2485	.....	
80,000	160,000	.28	.....	
82,000	164,000	.33	.....	
82,900	165,800	.....	.....	Tensile strength.
Fractured under the maximum load.				
0	0	.31	.....	= 6.2 per cent.

Fractured ″.35 from neck. Appearance, granular, radiating from an eccentric spot. Dark-brown color. Surface of stem, blue.
Local contraction not appreciable.
Diameter at fracture, ″.76. Area, .454 square inch.
Contraction, 9.2 per cent.
Elongation of inch sections, ″.05, ″.05, ″.06, ″.07, ″.08*.

No. 1948.

Marks, 9–756.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0205 in 6 inches.
Estimated temperature, 618° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
5,000	10,000	.0028	.....	
10,000	20,000	.0048	.....	
15,000	30,000	.0067	.....	
20,000	40,000	.0089	.....	
25,000	50,000	.0104	.....	
26,000	52,000	.0109	.....	
27,000	54,000	.0115	.....	
28,000	56,000	.0119	.....	
29,000	58,000	.0124	.....	Elastic limit.
30,000	60,000	.0135	.....	
31,000	62,000	.0146	.....	
32,000	64,000	.0162	.....	
33,000	66,000	.0176	.....	
34,000	68,000	.0195	.....	
35,000	70,000	.0215	.....	
36,000	72,000	.0236	.....	
38,000	76,000	.0273	.....	
40,000	80,000	.0325	.....	
42,000	84,000	.0388	.....	
44,000	88,000	.0454	.....	
46,000	92,000	.0520	.....	
48,000	96,000	.0585	.....	
50,000	100,000	.0662	.....	
52,000	104,000	.0741	.....	
54,000	108,000	.0827	.....	
56,000	112,000	.0921	.....	
58,000	116,000	.1016	.....	
60,000	120,000	.1123	.....	
62,000	124,000	.1218	.....	
64,000	128,000	.1328	.....	
66,000	132,000	.1452	.....	
68,000	136,000	.165	.....	
70,000	140,000	.18	.....	
72,000	144,000	.20	.....	
74,000	148,000	.225	.....	
76,000	152,000	.25	.....	
78,000	156,000	.31	.....	
79,030	158,000	.385	.....	
79,700	159,400	.50	.....	Tensile strength.
78,000	156,000	.....	.....	At time of fracture.
0	0	.53	.....	=10.6 per cent.

Fractured 2″.50 from neck. Appearance, granular, radiating from a point in the circumference. Dark-purple color with bronze hue.

Surface of stem, brown, with irregular shaped spots of blue-black color.

Local contraction, ″.9 each side of fracture.

Diameter at fracture, ″.73. Area, .419 square inch. Contraction 16.2 per cent.

Elongation of inch sections, ″.07, ″.13, ″.17*, ″.10, ″.06.

No. 1817.

Marks, 9–756.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, .″0240 in 6 inches.
Estimated temperature, 712° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
5,000	10,000	.0021	.....	
10,000	20,000	.0037	.....	
15,000	30,000	.0057	.....	
20,000	40,000	.0079	.....	
25,000	50,000	.0102	.....	
26,000	52,000	.0109	.....	
27,000	54,000	.0115	.....	Elastic limit.
28,000	56,000	.0124	.....	
29,000	58,000	.0133	.....	
30,000	60,000	.0149	.....	
31,000	62,000	.0160	.....	
32,000	64,000	.0182	.....	
33,000	66,000	.0196	.....	
34,000	68,000	.0224	.....	
36,000	72,000	.0271	.....	
38,000	76,000	.0323	.....	
40,000	80,000	.0419	.....	
44,000	88,000	.0514	.....	
48,000	96,000	.0668	.....	
52,000	104,000	.0851	.....	
56,000	112,000	.12	.....	
60,000	120,000	.135	.....	
62,000	124,000	.15	.....	
64,000	128,000	.165	.....	
66,000	132,000	.195	.....	
68,000	136,000	.23	.....	
70,000	140,000	.265	.....	
70,900	141,800	.345	.....	Tensile strength.
60,500	121,000	.....	.....	At time of fracture.
0	0	.57	.....	=11.4 per cent.

Fractured 2″.35 from neck. Appearance, silky, dark-blue color. Surface of stem, blue and purple color.

Local contraction, 1″ each side of fracture.

Diameter at fracture, ″.69. Area, .374 square inch. Contraction, 25.2 per cent.

Elongation of inch sections, ″.06, ″.16, ″.24*, ″.07, ″.04.

No. 1977.

Marks, 9–756.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0298 in 6 inches.
Estimated temperature, 867° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
5,000	10,000	.0028	.....	
10,000	20,000	.0046	.....	
15,000	30,000	.0068	.....	
20,000	40,000	.0093	.....	
25,000	50,000	.0128	.....	
26,000	52,000	.0141	.....	
27,000	54,000	.0149	.....	
28,000	56,000	.0161	.....	Elastic limit.
29,000	58,000	.0180	.....	
30,000	60,000	.0196	.....	
32,000	64,000	.0241	.....	
34,000	68,000	.0295	.....	
36,000	72,000	.0357	.....	
38,000	76,000	.0426	.....	
40,000	80,000	.0505	.....	
42,000	84,000	.0587	.....	
44,000	88,000	.0675	.....	
46,000	92,000	.0763	.....	
48,000	96,000	.0874	.....	
50,000	100,000	.1033	.....	
52,000	104,000	.1127	.....	
54,000	108,000	.1283	.....	
56,000	112,000	.1480	.....	
58,000	116,000	.1742	.....	
59,000	118,000	.1951	.....	
60,000	120,000	.2254	.....	
60,260	120,520	.....	.....	Throbs.
61,000	122,000	.....	.....	Tensile strength.
49,300	139,660	.....	.....	At time of fracture.
0	0	.63	.....	=12.6 per cent.

Fractured 1″.35 from neck. Surface, irregular with cavities; dark-blue color. Surface of stem, blue black.

Local contraction, 1″.25 each side of fracture.

Diameter at fracture, ″.67. Area, .353 square inch. Contraction, 29.4 per cent.

Elongation of inch sections, ″.15, ″.28*, ″.10, ″.06, ″.04.

No. 1819.

Marks, 9–756.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0334 in 6 inches.
Estimated temperature, 974° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
5,000	10,000	.0020	.....	
10,000	20,000	.0041	.....	
15,000	30,000	.0074	.....	
16,000	32,000	.0077	.....	
17,000	34,000	.0084	.....	
18,000	36,000	.0091	.....	
19,000	38,000	.0096	.....	
20,000	40,000	.0103	.....	Elastic limit.
21,000	42,000	.0112	.....	
22,000	44,000	.0123	.....	
23,000	46,000	.0130	.....	
24,000	48,000	.0142	.....	
25,000	50,000	.0152	.....	
26,000	52,000	.0168	.....	
27,000	54,000	.0186	.....	
28,000	56,000	.0208	.....	
29,000	58,000	.0231	.....	
30,000	60,000	.0256	.....	
32,000	64,000	.0312	.....	
34,000	68,000	.0397	.....	
38,000	76,000	.0573	.....	
40,000	80,000	.0700	.....	
42,000	84,000	.0813	.....	
44,000	88,000	.0909	.....	
46,000	92,000	.0990	.....	
48,000	96,000	.1319	.....	
50,000	100,000	.1612	.....	
52,000	104,000	.215	.....	
52,800	105,600	.305	.....	Tensile strength.
41,500	110,960	.....	.....	At time of fracture.
0	0	.55	.....	=11.0 per cent.

Fractured 2″.5 from neck. Appearance, spongy, granular; greenish-blue color. Surface of stem, dark blue and brown.

Local contraction, 1″ each side of fracture.

Diameter at fracture, ″.69. Area, .374 square inch. Contraction, 25.2 per cent.

Elongation of inch sections, ″.04, ″.12, ″.28*, ″.07, ″.04.

No. 1979.

Marks, 9–756.
Diameter, ″.793.
Sectional area, .494 square inch.
Expansion, ″.0354 in 6 inches.
Estimated temperature, 1018° Fahr.
Rapid fracture. Time of reaching the maximum load, 8 seconds.
Tensile strength, 54,900 pounds=111,130 pounds per square inch.
Fractured about 10 seconds after reaching the maximum load, 2″.6 from neck. Surface irregular, containing a seam ″.30 long. Surface of fracture and stem, blue-black color.
Local contraction, 1″.6 each side of fracture.
Diameter at fracture, ″.66. Area, .342 square inch. Contraction 30.8 per cent.
Elongation in 5 inches, ″.62=12.4 per cent.
Elongation of inch sections, ″.05, ″.15, ″.31*, ″.08, ″.03.

No. 1820.

Marks, 9–756.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0378 in 6 inches.
Estimated temperature, 1073° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
5,000	10,000	.0022	.....	
10,000	20,000	.0043	.....	
11,000	22,000	.0051	.....	
12,000	24,000	.0063	.....	
13,000	26,000	.0071	.....	
14,000	28,000	.0075	.....	
15,000	30,000	.0086	.....	
16,000	32,000	.0094	.....	Elastic limit.
17,000	34,000	.0106	.....	
18,000	36,000	.0120	.....	
19,000	38,000	.0133	.....	
20,000	40,000	.0148	.....	
21,000	42,000	.0161	.....	
22,000	44,000	.0175	.....	
23,000	46,000	.0189	.....	
24,000	48,000	.0208	.....	
25,000	50,000	.0236	.....	
26,000	52,000	.0271	.....	
27,000	54,000	.0309	.....	
28,000	56,000	.0352	.....	
29,000	58,000	.0395	.....	
30,000	60,000	.0428	.....	
32,000	64,000	.0546	.....	
34,000	68,000	.0703	.....	
36,000	72,000	.0900	.....	
38,000	76,000	.1137	.....	
40,000	80,000	.1494	.....	
41,000	82,000	.175	.....	
42,000	84,000	.215	.....	
42,750	85,500	.275 .345	.....	Tensile strength.
34,900	85,750	.....	.....	At time of fracture.
0	0	.56	.....	=11.2 per cent.

Fractured 2″ from neck. Appearance, spongy, granular; dark-blue color, tinged with green. Surface of stem, blue black.

Local contraction, ″.9 each side of fracture.

Diameter at fracture, ″.72. Area, .407 square inch. Contraction, 18.6 per cent.

Elongation of inch sections, ″.09, ″.19*, ″.15, ″.08, ″.05.

No. 1821.

Marks, 9–756.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0417 in 6 inches.
Estimated temperature, 1185° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
5,000	10,000	.0036	.....	
6,000	12,000	.0050	.....	
7,000	14,000	.0061	.....	
8,000	16,000	.0072	.....	
9,000	18,000	.0088	.....	
10,000	20,000	.0092	.....	
11,000	22,000	.0108	.....	
12,000	24,000	.0123	.....	
13,000	26,000	.0140	.....	
14,000	28,000	.0152	.....	Elastic limit (not well defined).
15,000	30,000	.0168	.....	
16,000	32,000	.0189	.....	
17,000	34,000	.0211	.....	
18,000	36,000	.0237	.....	
19,000	38,000	.0278	.....	
20,000	40,000	.0312	.....	
22,000	44,000	.0399	.....	
24,000	48,000	.0528	.....	
26,000	52,000	.0680	.....	
28,000	56,000	.0895	.....	
30,000	60,000	.1263	.....	
31,000	62,000	.1457	.....	
31,640	63,280	.1951	.....	Tensile strength.
28,400	67,780	.....	.....	At time of fracture.
0	0	.45	.....	=9.0 per cent.

Fractured ″.50 from neck. Appearance, granular, spongy; irregu
surface; dark-blue color. Surface of stem, blue black.

Local contraction extends to the neck, and 1″ from fracture.

Diameter at fracture, ″.73. Area, .419 square inch. Contracti
16.2 per cent.

Elongation of inch sections, ″.04, ″.05, ″.08, ″.09, ″.19*.

No. 1976.

Marks, 9–756.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0429 in 6 inches.
Estimated temperature, 1217° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
5,000	10,000	.0027	.....	
10,000	20,000	.0070	.....	
11,000	22,000	.0084	.....	
12,000	24,000	.0094	.....	
13,000	26,000	.0103	.....	Elastic limit.
14,000	28,000	.0118	.....	
15,000	30,000	.0130	.....	
16,000	32,000	.0157	.....	
17,000	34,000	.0181	.....	
18,000	36,000	.0215	.....	
19,000	38,000	.0247	.....	
20,000	40,000	.0288	.....	
21,000	42,000	.0337	.....	
22,000	44,000	.0401	.....	
23,000	46,000	.0471	.....	
24,000	48,000	.0559	.....	
25,000	50,000	.0644	.....	
26,000	52,000	.0726	.....	
27,000	54,000	.0820	.....	
28,000	56,000	.0975	.....	
29,000	58,000	.1176	.....	
30,000	60,000	.1369	.....	
31,000	62,000	.1813	.....	Tensile strength.
23,700	59.350	.....	.....	At time of fracture.
0	0	.51	.....	=10.2 per cent.

Fractured 2″.75 from neck. Surface of fracture, irregular, with shallow cavities; blue-black with greenish tinge. Surface of stem, same color.

Local contraction, 1″.6 each side of fracture.

Diameter at fracture, ″.71. Area, .396 square inch. Contraction, 20.8 per cent.

Elongation of inch sections, ″.03, ″.11, ″.26*, ″.08, ″.03.

No. 1822.

Marks, 9–756.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0454 in 6 inches.
Estimated temperature, 1284° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
5,000	10,000	.0030	.....	
6,000	12,000	.0041	.....	
7,000	14,000	.0052	.....	
8,000	16,000	.0058	.....	
9,000	18,000	.0069	.....	
10,000	20,000	.0076	.....	Elastic limit.
11,000	22,000	.0101	.....	
12,000	24,000	.0118	.....	
13,000	26,000	.0132	.....	
14,000	28,000	.0156	.....	
15,000	30,000	.0178	.....	
16,000	32,000	.0210	.....	
17,000	34,000	.0245	.....	
18,000	36,000	.0295	.....	
19,000	38,000	.0356	.....	
20,000	40,000	.0450	.....	
21,000	42,000	.0553	.....	
22,000	44,000	.0651	.....	
23,000	46,000	.0860	.....	
24,000	48,000	.1084	.....	
25,000	50,000	.1357	.....	
25,120	50,240	.1567 .38	.....	Tensile strength.
23,800	63,640	.....	.....	At time of fracture.
0	0	.43	.....	=8.6 per cent.

Fractured ″.50 from neck. Appearance, granular, spongy, irregular. Surface of fracture and stem, dark blue.

Local contraction extends to the neck, and 1″.1 from fracture.

Diameter at fracture, ″.69. Area, .374 square inch. Contraction, 25.2 per cent.

Elongation of inch sections, ″.05, ″.04, ″.02, ″.06, ″.26*.

No. 1823.

Marks, 9–756.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0520 in 6 inches.
Estimated temperature, 1460° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
2,000	4,000	.0011	.....	
3,000	6,000	.0016	.....	Elastic limit.
4,000	8,000	.0032	.....	
5,000	10,000	.0055	.....	
6,000	12,000	.0078	.....	
7,000	14,000	.0098	.....	
8,000	16,000	.0139	.....	
9,000	18,000	.0166	.....	
10,000	20,000	.0207	.....	
11,000	22,000	.0271	.....	
12,000	24,000	.0335	.....	
13,000	26,000	.0619	.....	
14,000	28,000	.0848	.....	
14,700	29,400	.1462	.....	Tensile strength.
0	0	.78	.....	=15.6 per cent.

Fractured 2″.75 from neck. Appearance, silky, spongy. Surface of stem and fracture, blue-black color.

Local contraction, 1″.3 each side of fracture. Raised a scale.

Diameter at fracture, ″.52. Area, .212 square inch. Contraction, 57.6 per cent.

Elongation of inch sections, ″.03, ″.14, ″.42*, ″.16, ″.03.

No. 1947.

Marks, 9–756.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0565 in 6 inches.
Estimated temperature, 1581° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
1,500	3,000	.0010	.....	
2,000	4,000	.0026	.....	No apparent elastic limit.
2,500	5,000	.0047	.....	
3,000	6,000	.0065	.....	
3,500	7,000	.0100	.....	
4,000	8,000	.0128	.....	
4,500	9,000	.0156	.....	
5,000	10,000	.0187	.....	
6,000	12,000	.0238	.....	
7,000	14,000	.0291	.....	
8,000	16,000	.0430	.....	
9,000	18,000	.0571	.....	
10,000	20,000	.0762	.....	
11,000	22,000	.1606	.....	Tensile strength.
0	0	1.67	.....	=33.4 per cent.

Fractured at the middle of stem. Appearance, silky, spongy. Surface of stem and fracture, blue-black.

Local contraction, ″.3 each side of fracture.

Diameter at fracture, ″.41. Area, .132 square inch. Contraction, 73.6 per cent.

Elongation of inch sections, ″.09, ″.37, ″.94*, ″.17, ″.10.

No. 1975.

Marks, 9–756.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0607 in 6 inches.
Estimated temperature, 1623° Fahr.
Rapid fracture. Time of reaching the maximum load, 5 seconds.
Tensile strength, 15,200 pounds = 30,400 pounds per square inch.
Fractured 3″ from neck. Appearance, silky. Surface of fracture and stem, blue black. Ends contain cavities.
Diameter at fracture, ″.41. Area, .132 square inch. Contraction, 73.6 per cent.
Elongation in 5 inches, 1″ = 20.0 per cent.
Elongation of inch sections, ″.03, ″.12, ″.74*, ″.08, ″.03.

No. 1950.

Marks, 9–756.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0583 in 6 inches.
Estimated temperature, 1629° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
1,500	3,000	.0021	.....	No appreciable elastic limit.
		.0039	.....	After 1 minute.
2,000	4,000	.0062	.....	
		.0082	.....	Do.
2,500	5,000	.0104	.....	
		.0128	.....	Do.
3,000	6,000	.0148	.....	
		.0178	.....	Do.
3,500	7,000	.0196	.....	
		.0237	.....	Do.
4,000	8,000	.0260	.....	
		.0302	.....	Do.
4,500	9,000	.0336	.....	
		.0389	.....	Do.
5,000	10,000	.0412	.....	
		.0478	.....	Do.
5,500	11,000	.0511	.....	
		.0612	.....	Do.
6,000	12,000	.0660	.....	
		.0762	.....	Do.
6,500	13,000	.0793	.....	
		.0943	.....	Do.
7,000	14,000	.1003	.....	
		.1213	.....	Do.
7,500	15,000	.1272	.....	
		.1547	.....	Do.
8,000	16,000	.1647	.....	
		.2112	.....	Do.
8,500	17,000	.2223	.....	
		.2893	.....	Do.
9,000	18,000	.3193	.....	Tensile strength.
0	0	1.35	.....	=27.0 per cent.

Fractured 3″ from neck. Appearance, silky, spongy. Surface of fracture and stem, dark-blue color.

Local contraction, 1″.8 each side of fracture.

Diameter at fracture, ″.41. Area, .132 square inch. Contraction, 73.6 per cent.

Elongation of inch sections, ″.09, ″.24, ″.82*, ″.13, ″.07.

No. 1974.

Marks, 9–756.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0596 in 6 inches.
Estimated temperature, 1663° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
2,000	4,000	.0026	.....	No elastic limit.
3,000	6,000	.0086	.....	
4,000	8,000	.0139	.....	
5,000	10,000	.0211	.....	
6,000	12,000	.0316	.....	
7,000	14,000	.0412	.....	
8,000	16,000	.0673	.....	
9,000	18,000	.1864	.....	Tensile strength.
1,800	25,350	.....	.....	At time of fracture.
0	0	1.43	.....	= 28.6 per cent.

Fractured 3″ from neck. Appearance, silky. Surface of fracture a
stem, blue black.
Local contraction, 2″ each side of fracture.
Diameter at fracture, ″.30. Area, .071 square inch. Contracti
85.8 per cent.
Elongation of inch sections, ″.07, ″.12, 1″.09*, ″.10, ″.05.

No. 1957.

Marks, 10–334.
Diameter, ″.798.
Sectional area, .50 square inch.
Temperature, 70° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
5,000	10,000	.0013	.....	
10,000	20,000	.0036	.....	
15,000	30,000	.0048	.....	
20,000	40,000	.0063	.....	
25,000	50,000	.0080	.....	
30,000	60,000	.0096	.....	
35,000	70,000	.0116	.....	
36,000	72,000	.0119	.....	
37,000	74,000	.0123	.....	
38,000	76,000	.0128	.....	
39,000	78,000	.0133	.....	
40,000	80,000	.0140	.....	
41,000	82,000	.....	.....	Elastic limit.
	Load fell.			
40,000	80,000	.0198	.....	
		.0213	.....	
41,000	82,000	.0273	.....	
42,000	84,000	.0320	.....	
43,000	86,000	.0350	.....	
44,000	88,000	.0390	.....	
45,000	90,000	.0433	.....	
46,000	92,000	.0462	.....	
47,000	94,000	.0513	.....	
48,000	96,000	.0550	.....	
49,000	98,000	.0587	.....	
50,000	100,000	.0636	.....	
52,000	104,000	.0738	.....	
54,000	108,000	.0828	.....	
56,000	112,000	.095	.....	
58,000	116,000	.10	.....	
60,000	120,000	.115	.....	
62,000	124,000	.13	.....	
64,000	128,000	.14	.....	
66,000	132,000	.155	.....	
68,000	136,000	.17	.....	
70,000	140,000	.20	.....	
72,000	144,000	.22	.....	
74,000	148,000	.26	.....	
76,000	152,000	.34	.....	
77,000	154,000	.....	.....	Tensile strength.
75,500	170,810	.....	.....	At time of fracture.
0	0	.43	.....	=8.6 per cent.

Fractured 2″.35 from neck. Appearance, granular, radiating from a point in the circumference.

Local contraction inappreciable.

Diameter at fracture, ″.75. Area, .442 square inch. Contraction, 1.6 per cent.

Elongation of inch sections, ″.06, ″.09, ″.14*, ″.08, ″.06.

No. 1971.

Marks, 10–334.
Diameter, ″.798.
Sectional area, .50 square inch.
Temperature, 70° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
5,000	10,000	.0009	.....	
10,000	20,000	.0028	.....	
15,000	30,000	.0054	.....	
20,000	40,000	.0066	.....	
25,000	50,000	.0085	.....	
30,000	60,000	.0104	.....	
35,000	70,000	.0120	.....	
38,000	76,000	.0127	.....	
39,000	78,000	.0129	.....	
40,000	80,000	.0133	.....	Elastic limit.
41,000	82,000	.0175	.....	
42,000	84,000	.0275	.....	
43,000	86,000	.0306	.....	
44,000	88,000	.0338	.....	
46,000	92,000	.0411	.....	
48,000	96,000	.0481	.....	
50,000	100,000	.0555	.....	
52,000	104,000	.0648	.....	
54,000	108,000	.0733	.....	
56,000	112,000	.0819	.....	
58,000	116,000	.0923	.....	
60,000	120,000	.1019	.....	
62,000	124,000	.1101	.....	
63,000	126,000	.1170	.....	
.....	.....	.1218	.....	After 1 minute.
.....	.....	.1226	.....	After 2 minutes.
.....	.....	.1232	.....	After 3 minutes.
.....	.....	.1240	.....	After 4 minutes.
.....	.....	.1242	.....	After 5 minutes.
.....	.....	.1242	.....	After 6 minutes.
.....	.....	.1246	.....	After 7 minutes.
.....	.....	.1247	.....	After 8 minutes.
.....	.....	.1248	.....	After 9 minutes.
.....	.....	.1249	.....	After 10 minutes.
66,000	132,000	.1363	.....	
67,000	134,000	.1443	.....	
68,000	136,000	.1514	.....	
69,000	138,000	.1586	.....	
70,000	140,000	.1695	.....	
.....	.....	.1760	.....	After 1 minute.
.....	.....	.1782	.....	After 2 minutes.
.....	.....	.1797	.....	After 3 minutes.
.....	.....	.1804	.....	After 4 minutes.
.....	.....	.1810	.....	After 5 minutes.
.....	.....	.1816	.....	After 6 minutes.
.....	.....	.1820	.....	After 7 minutes.
.....	.....	.1824	.....	After 8 minutes.
.....	.....	.1828	.....	After 9 minutes.
.....	.....	.1829	.....	After 10 minutes.
.....	.....	.1842	.....	After 15 minutes.
.....	.....	.1851	.....	After 20 minutes.
.....	.....	.1861	.....	After 30 minutes.
.....	.....	.1870	.....	After 40 minutes.
.....	.....	.1874	.....	After 50 minutes.
.....	.....	.1880	.....	After 60 minutes.
.....	.....	.1884	.....	After 70 minutes.
.....	.....	.1887	.....	After 80 minutes.
.....	.....	.1891	.....	After 90 minutes.
.....	.....	.1893	.....	After 100 minutes.
.....	.....	.1894	.....	After 110 minutes.
.....	.....	.1897	.....	After 120 minutes.
.....	.....	.1911	.....	After 180 minutes.
.....	.....	.1916	.....	After 240 minutes.
.....	.....	.1921	.....	After 300 minutes.

No. 1971—Continued.

Bar rested under a total load of 40,000 pounds for a period of 40 hours, after which it was increased to 70,000 pounds as before, which was sustained one hour, during which time the elongation increased the additional amount of ″.0008.

The loads were then gradually increased till the bar ruptured.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
73,000	146,000	.....	.....	Rapid stretching renewed.
77,700	155,400	.....	.....	Tensile strength.
76,300	172,620	.....	.....	At time of fracture.
0	0	.87	.....	=7.4 per cent.

Fractured 1″.09 from neck. Appearance, granular; radiating from a point in the circumference.

Local contraction, 1″ each side of fracture.

Diameter at fracture, ″.75. Area, .442 square inch. Contraction, 11.6 per cent.

Elongation of inch sections, ″.04, ″.05, ″.07, ″.12*, ″.09*.

No. 1960.

Marks, 10–334.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0072 in 6 inches.
Estimated temperature, 265° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
5,000	10,000	.0019	.....	
10,000	20,000	.0044	.....	
15,000	30,000	.0064	.....	
20,000	40,000	.0073	.....	
25,000	50,000	.0088	.....	
30,000	60,000	.0100	.....	
35,000	70,000	.0113	.....	
38,000	76,000	.0118	.....	Elastic limit.
38,500	77,000	.0162	.....	
39,000	78,000	.0239	.....	
40,000	80,000	.0248	.....	
42,000	84,000	.0258	.....	Feeble throbs.
44,000	88,000	.0371	.....	
46,000	92,000	.0418	.....	
48,000	96,000	.0492	.....	
50,000	100,000	.0578	.....	
52,000	104,000	.0706	.....	
54,000	108,000	.0816	.....	
56,000	112,000	.0912	.....	
58,000	116,000	.1026	.....	
60,000	120,000	.1122	.....	
62,000	124,000	.1259	.....	
64,000	128,000	.1387	.....	
66,000	132,000	.15	.....	
68,000	136,000	.185	.....	Feeble throbs repeated..
70,000	140,000	.21	.....	
72,000	144,000	.27	.....	
73,000	146,000	.305	.....	
73,980	147,960	.395	.....	Tensile strength.
73,300	165,840	.....	.....	At time of fracture.
0	0	.37	.....	=7.4 per cent.

Fractured, 2″.14 from neck. Appearance, granular, radiating from a dull spot at the circumference.

Local contraction, ″.6 and ″.8 on either side of the fracture.

Diameter at fracture, ″.75. Area, .442 square inch. Contraction, 11.6 per cent.

Elongation of inch sections, ″.05, ″.09*, ″.10*, ″.07, ″.06.

No. 1962.

Marks, 10–334.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0116 in 6 inches.
Estimated temperature, 384° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
5,000	10,000	.0040	.....	
10,000	20,000	.0070	.....	
15,000	30,000	.0096	.....	
20,000	40,000	.0114	.....	
25,000	50,000	.0133	.....	
30,000	60,000	.0153	.....	
31,000	62,000	.0158	.....	
32,000	64,000	.0163	.....	
33,000	66,000	.0169	.....	Elastic limit.
34,000	68,000	.0180	.....	
35,000	70,000	.0195	.....	
36,000	72,000	.0211	.....	
37,000	74,000	.0226	.....	
38,000	76,000	.0244	.....	
39,000	78,000	.0262	.....	
40,000	80,000	.0281	.....	
42,000	84,000	.0316	.....	
44,000	88,000	.0359	.....	
46,000	92,000	.0408	.....	
48,000	96,000	.0465	.....	
52,000	104,000	.0602	.....	
56,000	112,000	.0738	.....	
60,000	120,000	.0878	.....	
64,000	128,000	.1068	.....	
68,000	136,000	.1263	.....	
72,000	144,000	.1543	.....	
74,000	148,000	.175	.....	
76,000	152,000	.195	.....	
77,000	154,000	.21	.....	
78,000	156,000	.23	.....	
79,000	158,000	.24	.....	
80,000	160,000	.255	.....	
81,000	162,000	.265	.....	
82,000	164,000	.31	.....	
83,000	166,000	.35	.....	
83,700	167,400	.40	.....	Tensile strength.
83,800	188,400	.....	.....	At time of fracture.
0	0	.37	.....	=7.4 per cent.

Fractured ″.75 from neck. Appearance, granular, radiating from an eccentric point. No change in color. Surface of stem, light-straw color.

Local contraction extends to the neck, and ″.9 from the fracture.

Diameter at fracture, ″.75. Area, .442 square inch. Contraction, 11.6 per cent.

Elongation of inch sections, ″.06, ″.06, ″.06, ″.07, ″.12*.

No. 1961.

Marks, 10–334.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0124 in 6 inches.
Estimated temperature, 405° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
5,000	10,000	.0027	.....	
10,000	20,000	.0061	.....	
15,000	30,000	.0084	.....	
20,000	40,000	.0103	.....	
25,000	50,000	.0118	.....	
30,000	60,000	.0128	.....	
34,000	68,000	.0137	.....	
35,000	70,000	.0144	.....	Elastic limit.
36,000	72,000	.0156	.....	
37,000	74,000	.0171	.....	
38,000	76,000	.0187	.....	
39,000	78,000	.0204	.....	
40,000	80,000	.0221	.....	
42,000	84,000	.0258	.....	
44,000	88,000	.0299	.....	
46,000	92,000	.0348	.....	
48,000	96,000	.0399	.....	
50,000	100,000	.0468	.....	
52,000	104,000	.0541	.....	
54,000	108,000	.0606	.....	
56,000	112,000	.0677	.....	
58,000	116,000	.0746	.....	
60,000	120,000	.0842	.....	
62,000	124,000	.0939	.....	
64,000	128,000	.1047	.....	
66,000	132,000	.1144	.....	
68,000	136,000	.1297	.....	
70,000	140,000	.1450	.....	
72,000	144,000	.16	.....	
74,000	148,000	.205	.....	Feeble throbs.
76,000	152,000	.24	.....	
76,900	153,800	.30	.....	Tensile strength.
76,000	171,950	.....	.....	At time of fracture.
0	0	.29	.....	= 5.8 per cent.

Fractured ″.90 from neck. Appearance, granular, radiating from eccentric spot. No change in color. Surface of stem, straw color.

Local contraction, ″.9 each side of fracture.

Diameter at fracture, ″.75. Area, .442 square inch. Contraction 11.6 per cent.

Elongation of inch sections, ″.10*, ″.06, ″.05, ″.04, ″.04.

No. 1969.

Marks, 10–334.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0151 in 6 inches.
Estimated temperature, 478° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
5,000	10,000	.0012	.....	
10,000	20,000	.0031	.....	
15,000	30,000	.0054	.....	
20,000	40,000	.0070	.....	
25,000	50,000	.0089	.....	
28,000	56,000	.0101	.....	
29,000	58,000	.0105	.....	
30,000	60,000	.0110	.....	Elastic limit.
31,000	62,000	.0120	.....	
32,000	64,000	.0129	.....	
33,000	66,000	.0140	.....	
34,000	68,000	.0154	.....	
35,000	70,000	.0170	.....	
36,000	72,000	.0187	.....	
38,000	76,000	.0222	.....	
40,000	80,000	.0246	.....	
42,000	84,000	.0296	.....	
44,000	88,000	.0345	.....	
46,000	92,000	.0396	.....	
48,000	96,000	.0452	.....	
50,000	100,000	.0506	.....	
52,000	104,000	.0570	.....	
54,000	108,000	.0629	.....	
56,000	112,000	.0690	.....	
58,000	116,000	.0764	.....	
60,000	120,000	.0845	.....	
.....	.....	.0884	.....	After 1 minute.
.....	.....	.0945	.....	After 2 minutes.
.....	.....	.0960	.....	After 3 minutes.
.....	.....	.0972	.....	After 4 minutes.
.....	.....	.0979	.....	After 5 minutes.
.....	.....	.1001	.....	After 10 minutes.
Hot test discontinued.				
Length of 6-inch section hot				6″.0970
Length of 6-inch section cold				6″.0819
Contraction				0″.0151
Estimated temperature at close of test, 473° Fahr.				
0	0	.08	.....	= 1.6 per cent.

Elongation of inch sections, ″.01, ″.02, ″.02, ″.02, ″.01.
Minimum diameter, ″.7916. Area, .492 square inch. Contraction, 1.6 per cent.
Rested 4 days, test then completed at temperature of 70° Fahr.
Gauged length, 5″.08.
Mean sectional area, .492 square inch.

No. 1969—Continued.

Applied loads.		In ganged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	.....	0.	0.	Initial load.
5,000	.....	.0014	.....	
10,000	.....	.0061	.....	E = 30,890,000 pounds between 5,000 and 40,000 pounds load.
15,000	.....	.0047	.....	
20,000	.....	.0065	.....	
25,000	.....	.0082	.....	
30,000	.....	.0099	.....	
35,000	.....	.0116	.....	
40,000	.....	.0133	0.	
69,400	.....	.08	.....	Rapid stretching; new elastic limit.
	138,800	.....	.....	On original area.
	141,060	.....	.....	On reduced area.
72,000	.....	.09	.....	
76,000	.....	.15	.....	
79,260	.....	.29	.....	Tensile strength.
	158,520	.....	.....	On original area.
	161,100	.....	.....	On reduced area.
78,700	173,350	.....	.....	At time of fracture.
0	0	.35	.....	=7.0 per cent. total elongation.

Fractured 1″.20 from neck. Appearance, granular, radiating from a point in the circumference.

Local contraction, 1″ each side of fracture.

Diameter at fracture, ″.76. Area, .454 square inch. Contraction, 9.2 per cent.

Elongation of inch sections, ″.07, ″.09*, ″.07, ″.07, ″.05.

No. 1959.

Marks, 10–334.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0161 in 6 inches.
Estimated temperature, 505° Fahr.
Gauged length, ″5.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.]
5,000	10,000	.0057	.....	
10,000	20,000	.0092	.....	
15,000	30,000	.0126	.....	
20,000	40,000	.0148	.....	
25,000	50,000	.0167	.....	
30,000	60,000	.0195	.....	
35,000	70,000	.0254	.....	
36,000	72,000	.0272	.....	
37,000	74,000	.0288	.....	
38,000	76,000	.0308	.....	
39,000	78,000	.0327	.....	
40,000	80,000	.0347	.....	
41,000	82,000	.0358	.....	Elastic limit.
42,000	84,000	.0386	.....	
44,000	88,000	.0432	.....	
46,000	92,000	.0484	.....	
48,000	96,000	.0539	.....	
50,000	100,000	.0596	.....	
52,000	104,000	.0666	.....	
54,000	108,000	.0736	.....	
56,000	112,000	.0804	.....	
58,000	116,000	.0876	.....	
60,000	120,000	.0952	.....	
62,000	124,000	.1034	.....	
64,000	128,000	.1124	.....	
66,000	132,000	.1234	.....	
68,000	136,000	.145	.....	
70,000	140,000	.16	.....	
72,000	144,000	.18	.....	
74,000	148,000	.195	.....	
76,000	152,000	.215	.....	
78,000	156,000	.23	.....	
80,000	160,000	.265	.....	
81,000	162,000	.30	.....	
82,000	164,000	.33	.....	
83,000	166,000	.37	.....	
83,500	167,000	.41	.....	
84,000	168,000	.44	.....	
84,320	168,640	.47	.....	Tensile strength.
83,800	189,590	.....	.....	At time of fracture.
0	0	.50	.....	=100 per cent.

Fractured 2″.65 from neck. Appearance, granular, radiating from a point in the circumference. Brown color. Surface of stem, dark blue. Local contraction not appreciable.

Diameter at fracture, ″.75. Area, .442 square inch. Contraction, .6 per cent.

Elongation of inch sections: ″.08, ″.11, ″.13*, ″.11, ″.07.

No. 1970.

Marks, 10–334. Diameter, ″.789.
Sectional area, .50 square inch. Expansion, ″.0172 in 6 inches.
Estimated temperature, 535° Fahr. Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
5,000	10,000	.0010	.....	
10,000	20,000	.0035	.....	
15,000	30,000	.0064	.....	
20,000	40,000	.0082	.....	
25,000	50,000	.0101	.....	
26,000	52,000	.0106	.....	
27,000	54,000	.0111	.....	
28,000	56,000	.0116	.....	
29,000	58,000	.0123	.....	
30,000	60,000	.0130	.....	
31,000	62,000	.0141	.....	
32,000	64,000	.0149	.....	Elastic limit (not well defined).
33,000	66,000	.0160	.....	
34,000	68,000	.0172	.....	
35,000	70,000	.0186	.....	
36,000	72,000	.0202	.....	
37,000	74,000	.0217	.....	
38,000	76,000	.0237	.....	
40,000	80,000	.0261	.....	
42,000	84,000	.0317	.....	
44,000	88,000	.0365	.....	
46,000	92,000	.0418	.....	
48,000	96,000	.0478	.....	
50,000	100,000	.0529	.....	
54,000	108,000	.0677	.....	
58,000	116,000	.0817	.....	
62,000	124,000	.0998	.....	
63,000	126,000	.1029	.....	
.....	.....	.1122	.....	After 1 minute.
.....	.....	.1174	.....	After 2 minutes.
.....	.....	.1196	.....	After 3 minutes.
.....	.....	.1215	.....	After 4 minutes.
.....	.....	.1226	.....	After 5 minutes.
.....	.....	.1236	.....	After 6 minutes.
.....	.....	.1245	.....	After 7 minutes.
.....	.....	.1252	.....	After 8 minutes.
.....	.....	.1257	.....	After 9 minutes.
.....	.....	.1262	.....	After 10 minutes.
70,000	140,000	.1821	.....	
.....	.....	.1501	.....	After 1 minute.
.....	.....	.1581	.....	After 2 minutes.
.....	.....	.1632	.....	After 3 minutes.
.....	.....	.1666	.....	After 4 minutes.
.....	.....	.1693	.....	After 5 minutes.
.....	.....	.1714	.....	After 6 minutes.
.....	.....	.1733	.....	After 7 minutes.
.....	.....	.1748	.....	After 8 minutes.
.....	.....	.1761	.....	After 9 minutes.
.....	.....	.1772	.....	After 10 minutes.
.....	.....	.1815	.....	After 15 minutes.
.....	.....	.1846	.....	After 20 minutes.
.....	.....	.1882	.....	After 30 minutes.
.....	.....	.1906	.....	After 40 minutes.
.....	.....	.1925	.....	After 50 minutes.
.....	.....	.1939	.....	After 60 minutes.
.....	.....	.1951	.....	After 70 minutes.
.....	.....	.1962	.....	After 80 minutes.
.....	.....	.1971	.....	After 90 minutes.
.....	.....	.1981	.....	After 100 minutes.
.....	.....	.1988	.....	After 110 minutes.
.....	.....	.1996	.....	After 120 minutes.
.....	.....	.2002	.....	After 130 minutes.
.....	.....	.2010	.....	After 140 minutes.
.....	.....	.2015	.....	After 150 minutes.
.....	.....	.2020	.....	After 160 minutes.
.....	.....	.2025	.....	After 170 minutes.
.....	.....	.2028	.....	After 180 minutes.

Hot test discontinued.

No. 1970—Continued.

Length of 6-inch section hot	inches..	6.2004
Length of 6-inch section cold	do....	6.1832
Contraction	do....	.0172

Estimated temperature at close of test, 521° Fahr. Total elongation, ″.17 = 3.4 per cent.

Elongation of inch sections, ″.02, ″.04, ″.04, ″.04, ″.03.

Minimum diameter, ″.7847. Area, .484 square inch. Contraction, 3.2 per cent.

Rested 3 days; test then completed at temperature of 70° Fahr.

Gauged length, 5″.17.

Mean sectional area, .484 square inch.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	.....	0.	0.	Initial load.
5,000	.....	.0018	.....	
10,000	.....	.0036	.....	
15,000	.....	.0053	.....	
20,000	.....	.0072	.....	
25,000	.....	.0089	.....	
30,000	.....	.0108	.....	
35,000	.....	.0126	.....	
40,000	.....	.0144	.0001	
82,200	.....	.06	.....	Rapid stretching. New elastic limit.
	164,400	.....	.....	On original area.
	169,830	.....	.....	On reduced area.
83,000	.....	.09	.....	
83,700	.....	.17	.....	Tensile strength.
	167,400	.....	.....	On original area.
	172,930	.....	.....	On reduced area.
81,900	180,400	.....	.....	At time of fracture.
0	0	.32	.....	= 6.4 per cent. total elongation.

Fractured ″.75 from neck. Appearance, granular, radiating from a small dull spot near the center of the fractured surface.

Local contraction, ″.75 each side of fracture.

Diameter at fracture, ″.76. Area, .454 square inch. Contraction, 9.2 per cent.

Elongation of inch sections, ″.04, ″.05, ″.06, ″.06, ″.11*.

No. 1958.

Marks, 10–334.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0217 in 6 inches.
Estimated temperature, 656° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
5,000	10,000	.0067	.....	
10,000	20,000	.0101	.....	
15,000	30,000	.0133	.....	
20,000	40,000	.0152	.....	
25,000	50,000	.0187	.....	
26,000	52,000	.0191	.....	
27,000	54,000	.0199	.....	
28,000	56,000	.0208	.....	
29,000	58,000	.0216	.....	
30,000	60,000	.0228	.....	
31,000	62,000	.0237	.....	Elastic limit.
32,000	64,000	.0251	.....	
33,000	66,000	.0267	.....	
34,000	68,000	.0282	.....	
35,000	70,000	.0304	.....	
36,000	72,000	.0323	.....	
37,000	74,000	.0344	.....	
38,000	76,000	.0374	.....	
39,000	78,000	.0400	.....	
40,000	80,000	.0426	.....	
42,000	84,000	.0479	.....	
44,000	88,000	.0547	.....	
46,000	92,000	.0609	.....	
48,000	96,000	.0685	.....	
50,000	100,000	.0754	.....	
52,000	104,000	.0845	.....	
54,000	108,000	.0947	.....	
56,000	112,000	.0978	.....	
58,000	116,000	.11	.....	
60,000	120,000	.115	.....	
62,000	124,000	.13	.....	
64,000	128,000	.15	.....	
66,000	132,000	.155	.....	
68,000	136,000	.18	.....	
70,000	140,000	.215	.....	
72,000	144,000	.245	.....	
74,000	148,000	.30	.....	
74,980	149,960	.385	.....	Tensile strength.
61,000	172,800	.....	.....	At time of fracture.
0	0	.69		=13.8 per cent.

Fractured 1″.50 from neck. Appearance, silky, spongy; dark-blue color. Surface of stem, light purple with bronze hue.

Local contraction, 1″ each side of fracture

Diameter at fracture, ″.67. Area, .353 square inch. Contraction, 29.4 per cent.

Elongation of inch sections, ″.06, ″.08, ″.11, ″.27*, ″.17.

No. 1952.

Marks, 10–334.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0254 in 6 inches.
Estimated temperature, 736° Fahr.
Gauged length, 5′.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
5,000	10,000	.0034	.....	
10,000	20,000	.0064	.....	
15,000	30,000	.0089	.....	
20,000	40,000	.0107	.....	
25,000	50,000	.0130	.....	
26,000	52,000	.0136	.....	
27,000	54,000	.0144	.....	
28,000	56,000	.0152	.....	
29,000	58,000	.0162	.....	
30,000	60,000	.0175	.....	
31,000	62,000	.0190	.....	
32,000	64,000	.0208	.....	
33,000	66,000	.0223	.....	Probable elastic limit (not well defined).
34,000	68,000	.0245	.....	
35,000	70,000	.0268	.....	
36,000	72,000	.0294	.....	
38,000	76,000	.0338	.....	
40,000	80,000	.0410	.....	
42,000	84,000	.0476	.....	
44,000	88,000	.0546	.....	
46,000	92,000	.0621	.....	
48,000	96,000	.0694	.....	
50,000	100,000	.0786	.....	
52,000	104,000	.0876	.....	
54,000	108,000	.0986	.....	
56,000	112,000	.1092	.....	
58,000	116,000	.1208	.....	
60,000	120,000	.1362	.....	
62,000	124,000	.155	.....	
64,000	128,000	.185	.....	
66,000	132,000	.23	.....	
67,000	134,000	.28	.....	
67,100	134,200	.31	.....	Tensile strength.
53,900	148,480	.....	.....	At time of fracture.
0	0	.58	.....	=11.6 per cent.

Fractured 1″.19 from neck. Appearance, spongy.
Surface of fracture and stem, dark-blue color.
Local contraction, ″.9 each side of fracture.
Diameter at fracture, ″.68. Area, .363 square inch. Contraction, 27.4 per cent.
Elongation of inch sections, ″.19*, ″.20*, ″.08, ″.06, ″.05.

No. 1968.

Marks, 10–334.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0263 in 6 inches.
Estimated temperature, 781° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
5,000	10,000	.0024	.....	
.....	.....	.0024	.....	After 1 minute.
6,000	12,000	.0032	.....	
7,000	14,000	.0040	.....	
8,000	16,000	.0047	.....	
9,000	18,000	.0053	.....	
10,000	20,000	.0060	.....	
.....	.....	.0060	.....	Do.
11,000	22,000	.0068	.....	
12,000	24,000	.0076	.....	
.....	.....	.0076	.....	Do.
13,000	26,000	.0084	.....	
14,000	28,000	.0092	.....	
15,000	30,000	.0100	.....	
.....	.....	.0101	.....	Do.
16,000	32,000	.0106	.....	
17,000	34,000	.0115	.....	
18,000	36,000	.0121	.....	
.....	.....	.0123	.....	Do.
19,000	38,000	.0128	.....	
20,000	40,000	.0129	.....	Elastic limit (not well defined).
.....	.....	.0136	.....	After 1 minute.
.....	.....	.0138	.....	After 2 minutes.
21,000	42,000	.0143	.....	
22,000	44,000	.0151	.....	
.....	.....	.0153	.....	After 1 minute.
.....	.....	.0155	.....	After 2 minutes.
23,000	46,000	.0161	.....	
24,000	48,000	.0168	.....	
.....	.....	.0172	.....	After 1 minute.
.....	.....	.0175	.....	After 2 minutes.
.....	.....	.0173	.....	After 3 minutes.
.....	.....	.0177	.....	After 4 minutes.
.....	.....	.0178	.....	After 5 minutes.
25,000	50,000	.0182	.....	
26,000	52,000	.0188	.....	
27,000	54,000	.0197	.....	
.....	.....	.0204	.....	After 1 minute.
.....	.....	.0208	.....	After 2 minutes.
.....	.....	.0210	.....	After 3 minutes.
.....	.....	.0211	.....	After 4 minutes.
.....	.....	.0212	.....	After 5 minutes.
28,000	56,000	.0217	.....	
29,000	58,000	.0219	.....	
30,000	60,000	.0235	.....	
.....	.....	.0247	.....	After 1 minute.
.....	.....	.0252	.....	After 2 minutes.
.....	.....	.0257	.....	After 3 minutes.
.....	.....	.0259	.....	After 4 minutes.
.....	.....	.0261	.....	After 5 minutes.
31,000	62,000	.0266	.....	
32,000	64,000	.0271	.....	
33,000	66,000	.0288	.....	
34,000	68,000	.0313	.....	
35,000	70,000	.0337	.....	
.....	.....	.0366	.....	After 1 minute.
.....	.....	.0374	.....	After 2 minutes.
.....	.....	.0381	.....	After 3 minutes.
.....	.....	.0385	.....	After 4 minutes.
.....	.....	.0388	.....	After 5 minutes.
.....	.....	.0397	.....	After 10 minutes.
.....	.....	.0404	.....	After 15 minutes.
.....	.....	.0408	.....	After 20 minutes.
.....	.....	.0413	.....	After 25 minutes.
.....	.....	.0415	.....	After 30 minutes.
.....	.....	.0417	.....	After 35 minutes.
.....	.....	.0419	.....	After 40 minutes.
36,000	72,000	.0423	.....	
37,000	74,000	.0428	.....	

No. 1968—Continued.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
38,000	76,000	.0432	.....	
39,000	78,000	.0443	.....	
40,000	80,000	.0488	.....	
.....	.....	.0526	.....	After 1 minute.
.....	.....	.0536	.....	After 2 minutes.
.....	.....	.0546	.....	After 3 minutes.
.....	.....	.0552	.....	After 4 minutes.
.....	.....	.0555	.....	After 5 minutes.
.....	.....	.0570	.....	After 10 minutes.
.....	.....	.0577	.....	After 15 minutes.
.....	.....	.0583	.....	After 20 minutes.
.....	.....	.0589	.....	After 25 minutes.
.....	.....	.0612	.....	After 60 minutes.

Hot test discontinued.

Length of 6-inch section hot	inches	6.0606
Length of 6-inch section cold	do	6.0346
Contraction	do	.0260

Estimated temperature at close of test, 769° Fahr.
Total elongation, ″.035 = 0.7 per cent.
Elongation of inch sections, ″.00½, ″.00½, ″.01, ″.01, ″.00½.
Minimum diameter, ″.796. Area, .498 square inch. Contraction, 0.4 per cent.
Rested 4 days; test then completed at temperature of 70° Fahr.
Gauged length, 5″.035.
Mean sectional area, .497 square inch.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	.....	0.	0.	Initial load.
5,000	.....	.0012	.....	
10,000	.....	.0029	.....	E=29,320,000 pounds between 5,000 and 40,000 pounds.
15,000	.....	.0046	.....	
20,000	.....	.0064	.....	
25,000	.....	.0082	.....	
30,000	.....	.0098	.....	
35,000	.....	.0116	.....	
40,000	.....	.0133	0.	
55,000	.....	.....	.....	Rapid stretching. New elastic limit.
	110,000	.....	.....	On original area.
	110,440	.....	.....	On reduced area.
56,000	.....	.05	.....	
58,000	.....	.065	.....	
60,000	.....	.075	.....	
64,000	.....	.10	.....	
68,000	.....	.125	.....	
72,000	.....	.17	.....	
76,000	.....	.25	.....	
77,520	.....	.35	.....	Tensile strength. } Fractured under the maximum load.
	155,040	.....	.....	On original area. }
	155,660	.....	.....	On reduced area. }
0	0	.38	.....	=7.6 per cent. total elongation.

Fractured 2″.35 from neck. Appearance, granular, radiating from point in the circumference.
Local contraction inappreciable.
Diameter at fracture, ″.76. Area, .454 square inch. Contraction, 9.2 per cent.
Elongation of inch sections, ″.05, ″.08, ″.11*, ″.08, ″.06.

No. 1972.

Marks, 10–334.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0295 in 6 inches.
Estimated temperature, 867° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
5,000	10,000	.0032	.....	
10,000	20,000	.0069	.....	
15,000	30,000	.0102	.....	
20,000	40,000	.0125	.....	
21,000	42,000	.0130	.....	
22,000	44,000	.0136	.....	
23,000	46,000	.0146	.....	
24,000	48,000	.0153	.....	
25,000	50,000	.0160	.....	
26,000	52,000	.0169	.....	Elastic limit (not well defined).
27,000	54,000	.0181	.....	
28,000	56,000	.0193	.....	
29,000	58,000	.0207	.....	
30,000	60,000	.0221	.....	
31,000	62,000	.0241	.....	
32,000	64,000	.0263	.....	
33,000	66,000	.0286	.....	
34,000	68,000	.0312	.....	
35,000	70,000	.0342	.....	
36,000	72,000	.0366	.....	
38,000	76,000	.0433	.....	
40,000	80,000	.0498	.....	
44,000	88,000	.0680	.....	
48,000	96,000	.0883	.....	
52,000	104,000	.1146	.....	
56,000	112,000	.1580	.....	
57,000	114,000	.1705	.....	
58,000	116,000	.1919	.....	
59,000	118,000	.2217	.....	
59,500	119,000	.2674	.....	Tensile strength.
52,800	141,180	.....	.....	At time of fracture.
0	0	.43	.....	=8.6 per cent.

Fractured ″.50 from neck. Appearance, silky; dark-blue color.
Surface of stem, blue black.
Local contraction extends to the neck, and 1″.1 from the place of rupture.
Diameter at fracture, ″.69. Area, .374 square inch. Contraction, 25.2 per cent.
Elongation of inch sections, ″.09, ″.05, ″.04, ″.05, ″.20*.

No. 1953.

Marks, 10–334.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, .0310 in 6 inches.
Estimated temperature, 908° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
5,000	10,000	.0039	.....	
10,000	20,000	.0073	.....	
15,000	30,000	.0103	.....	
20,000	40,000	.0131	.....	
25,000	50,000	.0163	.....	
26,000	52,000	.0169	.....	
27,000	54,000	.0195	.....	
28,000	56,000	.0201	.....	Elastic limit.
29,000	58,000	.0216	.....	
30,000	60,000	.0239	.....	
31,000	62,000	.0260	.....	
32,000	64,000	.0298	.....	
34,000	68,000	.0343	.....	
36,000	72,000	.0412	.....	
38,000	76,000	.0498	.....	
40,000	80,000	.0580	.....	
42,000	84,000	.0668	.....	
44,000	88,000	.0766	.....	
46,000	92,000	.0901	.....	
48,000	96,000	.1014	.....	
50,000	100,000	.1168	.....	
52,000	104,000	.1366	.....	
54,000	108,000	.1616	.....	
55,000	110,000	.24	.....	Tensile strength.
42,300	117,910	.....	.....	At time of fracture.
0	0	.76	.....	=15.2 per cent.

Fractured 2″.65 from neck. Appearance, spongy; greenish blue color. Surface of stem, blue black.

Local contraction, 1″ each side of fracture.

Diameter at fracture, ″.68. Area, .363 square inch. Contraction, 27.4 per cent.

Elongation of inch sections, ″.08, ″.19, ″.31*, ″.12, ″.06.

No. 1954.

Marks, 10–334.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0387 in 6 inches.
Estimated temperature, 1116° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
5,000	10,000	.0067	.....	
10,000	20,000	.0103	.....	
15,000	30,000	.0153	.....	
16,000	32,000	.0164	.....	
17,000	34,000	.0176	.....	
18,000	36,000	.0189	.....	
19,000	38,000	.0199	.....	
20,000	40,000	.0211	.....	Elastic limit.
21,000	42,000	.0230	.....	
22,000	44,000	.0250	.....	
23,000	46,000	.0278	.....	
24,000	48,000	.0307	.....	
25,000	50,000	.0380	.....	
26,000	52,000	.0365	.....	
27,000	54,000	.0409	.....	
28,000	56,000	.0451	.....	
29,000	58,000	.0504	.....	
30,000	60,000	.0567	.....	
32,000	64,000	.0693	.....	
34,000	68,000	.0859	.....	
36,000	72,000	.1129	.....	
37,000	74,000	.1296	.....	
38,000	76,000	.1528	.....	
39,000	78,000	.1799	.....	
39,400	78,800	.2150	.....	Tensile strength.
32,000	76,370	.....	.....	At time of fracture.
0	0	.58	.....	=11.6 per cent.

Fractured 2″.50 from neck. Appearance, spongy; dark blue with purple cast. Surface of stem, blue black.

Local contraction, ″.5 each side of fracture.

Diameter at fracture, ″.73. Area, .419 square inch. Contraction, 16.2 per cent.

Elongation of inch sections, ″.06, ″.11, ″.22*, ″.14, ″.05.

No. 1963.

Marks, 10–334.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0407 in 6 inches.
Estimated temperature, 1170° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
5,000	10,000	.0067	.....	
10,000	20,000	.0136	.....	
.....	.....	.0149	.....	After 1 minute.
11,000	22,000	.0162	.....	
.....	.....	.0169	.....	Do.
12,000	24,000	.0181	.....	
.....	.....	.0189	.....	Do.
13,000	26,000	.0200	.....	
.....	.....	.0211	.....	Do.
14,000	28,000	.0221	.....	
.....	.....	.0232	.....	Do.
15,000	30,000	.0242	.....	
.....	.....	.0253	.....	Do.
16,000	32,000	.0263	.....	
.....	.....	.0278	.....	Do.
17,000	34,000	.0288	.....	
.....	.....	.0304	.....	Do.
18,000	36,000	.0317	.....	
.....	.....	.0334	.....	Do.
19,000	38,000	.0351	.....	
.....	.....	.0371	.....	Do.
20,000	40,000	.0386	.....	
.....	.....	.0412	.....	Do.
.....	.....	.0434	.....	After 2 minutes.
.....	.....	.0457	.....	After 3 minutes.
.....	.....	.0474	.....	After 4 minutes.
.....	.....	.0491	.....	After 5 minutes.
.....	.....	.0556	.....	After 10 minutes.
.....	.....	.0616	.....	After 15 minutes.
.....	.....	.0669	.....	After 20 minutes.
.....	.....	.0718	.....	After 25 minutes.
.....	.....	.0761	.....	After 30 minutes.
.....	.....	.0804	.....	After 35 minutes.
.....	.....	.0847	.....	After 40 minutes.
.....	.....	.0889	.....	After 45 minutes.
.....	.....	.0928	.....	After 50 minutes.
.....	.....	.0965	.....	After 55 minutes.
.....	.....	.1006	.....	After 60 minutes.
.....	.....	.1046	.....	After 65 minutes.
.....	.....	.1084	.....	After 70 minutes.
.....	.....	.1121	.....	After 75 minutes.
.....	.....	.1161	.....	After 80 minutes.
.....	.....	.1201	.....	After 85 minutes.
.....	.....	.1242	.....	After 90 minutes.
.....	.....	.1278	.....	After 95 minutes.
.....	.....	.1316	.....	After 100 minutes.
.....	.....	.1352	.....	After 105 minutes.
.....	.....	.1392	.....	After 110 minutes.
.....	.....	.1425	.....	After 115 minutes.
.....	.....	.1461	.....	After 120 minutes.
.....	.....	.1498	.....	After 125 minutes.
.....	.....	.1535	.....	After 130 minutes.
.....	.....	.1570	.....	After 135 minutes.
.....	.....	.1609	.....	After 140 minutes.
.....	.....	.1651	.....	After 145 minutes.
.....	.....	.1694	.....	After 150 minutes.
.....	.....	.1730	.....	After 155 minutes.
.....	.....	.1773	.....	After 160 minutes.
.....	.....	.1814	.....	After 165 minutes.
.....	.....	.1857	.....	After 170 minutes.
.....	.....	.1898	.....	After 175 minutes.
.....	.....	.1943	.....	After 180 minutes.

Hot test discontinued.

No. 1963—Continued.

Length of 6-inch section hot .....inches.. 6.2020
Length of 6-inch section cold .....do.... 6.1595

Contraction .....do.... .0425

Estimated temperature at close of test, 1189° Fahr.
Total elongation, ".16 = 3.2 per cent.
Elongation of inch sections, ".02, ".035, ".045, ".04, ".02.
Minimum diameter, ".782. Area, .480 square inch. Contraction, 4.0 per cent.
Rested 18 hours, and then test completed at temperature of 70° Fahr.
Gauged length, 5".16.
Mean sectional area, .484 square inch.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	.....	0.	0.	Initial load.
5,000	.....	.0014	.....	
10,000	.....	.0031	.....	E = 29,850,000 pounds between 5,000 and 40,000 pounds.
15,000	.....	.0048	.....	
20,000	.....	.0065	.....	
25,000	.....	.0082	—.0002	
30,000	.....	.0101	.....	
35,000	.....	.0118	.....	
40,000	.....	.0137	—.0002	
45,000	.....	.0158	.....	
45,300	.....	.0160	.....	Elastic limit.
	91,600	.....	.....	On original area.
	95,420	.....	.....	On reduced area.
46,000	.....	.0195	.....	
46,500	.....	.0250	.....	
47,000	.....	.0309	.....	
48,000	.....	.0359	.....	
49,000	.....	.0406	.....	
50,000	.....	.0455	.....	
52,000	.....	.0563	.....	
54,000	.....	.0663	.....	
55,000	.....	.0703	.....	
.....	.....	.0727	.....	After 1 minute.
.....	.....	.0730	.....	After 2 minutes.
.....	.....	.0733	.....	After 3 minutes.
.....	.....	.0735	.....	After 4 minutes.
.....	.....	.0737	.....	After 5 minutes.
.....	.....	.0742	.....	After 10 minutes.
.....	.....	.0747	.....	After 20 minutes.
.....	.....	.0751	.....	After 40 minutes.
.....	.....	.0757	.....	After 100 minutes.
.....	.....	.0762	.....	After 160 minutes.
.....	.....	.0762	.....	After 220 minutes.
.....	.....	.0762	.....	After 280 minutes.
56,000	.....	.0767	.....	
57,000	.....	.0802	.....	
58,000	.....	.0887	.....	
59,000	.....	.0942	.....	
60,000	.....	.1011	.....	
62,000	.....	.11	.....	
64,000	.....	.12	.....	
66,000	.....	.14	.....	
68,000	.....	.16	.....	
70,000	.....	.19	.....	
72,000	.....	.23	.....	
73,800	.....	.....	.....	Tensile strength.
	147,600	.....	.....	On original area.
	153,750	.....	.....	On reduced area.
0	0	.37	.....	= 7.4 per cent. total elongation.

Fractured in head at root of last thread. Appearance, granular, radiating from a point in the circumference.
Minimum diameter of stem, ".76. Area, .454 square inch. Contraction, 9.2 per cent.
Elongation of inch sections, ".05, ".07, ".10, ".09, ".06.

No. 1965.

Marks, 10–334. Diameter, ″.798. Sectional area, .50 square inch. Expansion, ″.0441 in 6 inches. Estimated temperature, 1262° Fahr. Gauged length, 5″.

Applied loads.		In-gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
5,000	10,000	.0051	.....	Elastic limit not determined.
.....	.....	.0063	.....	After 1 minute.
.....	.....	.0086	.....	After 2 minutes.
.....	.....	.0097	.....	After 3 minutes.
.....	.....	.0105	.....	After 4 minutes.
.....	.....	.0114	.....	After 5 minutes.
.....	.....	.0149	.....	After 10 minutes.
.....	.....	.0177	.....	After 15 minutes.
.....	.....	.0201	.....	After 20 minutes.
.....	.....	.0216	.....	After 25 minutes.
.....	.....	.0223	.....	After 30 minutes.
.....	.....	.0223	.....	After 35 minutes.
.....	.....	.0225	.....	After 40 minutes.
.....	.....	.0225	.....	After 45 minutes.
.....	.....	.0227	.....	After 50 minutes.
.....	.....	.0229	.....	After 55 minutes.
.....	.....	.0233	.....	After 60 minutes.
.....	.....	.0236	.....	After 65 minutes.
.....	.....	.0238	.....	After 70 minutes.
6,000	12,000	.0247	.....	
7,000	14,000	.0253	.....	
8,000	16,000	.0262	.....	
9,000	18,000	.0273	.....	
10,000	20,000	.0285	.....	
.....	.....	.0298	.....	After 1 minute.
.....	.....	.0302	.....	After 2 minutes.
.....	.....	.0309	.....	After 3 minutes.
.....	.....	.0316	.....	After 4 minutes.
.....	.....	.0320	.....	After 5 minutes.
.....	.....	.0342	.....	After 10 minutes.
.....	.....	.0360	.....	After 15 minutes.
.....	.....	.0375	.....	After 20 minutes.
.....	.....	.0388	.....	After 25 minutes.
.....	.....	.0399	.....	After 30 minutes.
.....	.....	.0416	.....	After 35 minutes.
.....	.....	.0428	.....	After 40 minutes.
.....	.....	.0436	.....	After 45 minutes.
.....	.....	.0446	.....	After 50 minutes.
.....	.....	.0456	.....	After 55 minutes.
.....	.....	.0471	.....	After 60 minutes.
.....	.....	.0482	.....	After 65 minutes.
.....	.....	.0492	.....	After 70 minutes.
11,000	22,000	.0499	.....	
12,000	24,000	.0509	.....	
13,000	26,000	.0520	.....	
14,000	28,000	.0531	.....	
15,000	30,000	.0552	.....	
.....	.....	.0578	.....	After 1 minute.
.....	.....	.0599	.....	After 2 minutes.
.....	.....	.0620	.....	After 3 minutes.
.....	.....	.0636	.....	After 4 minutes.
.....	.....	.0652	.....	After 5 minutes.
.....	.....	.0727	.....	After 10 minutes.
.....	.....	.0787	.....	After 15 minutes.
.....	.....	.0842	.....	After 20 minutes.

Hot test discontinued.

ength of 6-inch section hot	inches..	6.0951
ength of 6-inch section cold	do...	6.0495
Contraction	do...	.0456

Estimated temperature at close of test, 1292° Fahr. Total elongation, .05=1.0 per cent. Elongation of inch sections, ″.01, ″.01, ″.01, ″.01, .01. Minimum diameter, ″.7940. Area, .495 square inch. Contraction, 1.0 per cent. Test completed at temperature of 70° Fahr.

No. 1965—Continued.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	.....	0.	0.	Initial load.
5,000	.....	.0015	.....	
10,000	.....	.0028	.....	
15,000	.....	.0043	.....	
20,000	.....	.0059	.....	
25,000	.....	.0072	.....	
30,000	.....	.0088	.....	
35,000	.....	.0101	.....	
40,000	.....	.0113	.....	
44,000	.....	.0115	.....	Elastic limit.
	88,000	.....	.....	On original area.
	88,800	.....	.....	On reduced area.
Load fell.				
43,000	.....	.0150	.....	
	.....	.0170	.....	
44,000	.....	.0278	.....	
45,000	.....	.0310	.....	
46,000	.....	.0371	.....	
48,000	.....	.0446	.....	
50,000	.....	.0530	.....	
52,000	.....	.0623	.....	
54,000	.....	.0708	.....	
56,000	.....	.085	.....	
58,000	.....	.095	.....	
60,000	.....	.105	.....	
62,000	.....	.12	.....	
64,000	.....	.13	.....	
66,000	.....	.145	.....	
68,000	.....	.165	.....	
70,000	.....	.19	.....	
72,000	.....	.22	.....	
74,000	.....	.275	.....	
75,000	.....	.33	.....	
75,100	.....	.37	.....	Tensile strength.
	150,200	.....	.....	On original area.
	151,720	.....	.....	On reduced area.
74,500	168,550	.....	.....	At time of fracture.
0	0	.40	.....	= 8.0 per cent.

Fractured 2″.50 from neck. Appearance, granular, radiating fro a point in the circumference.

Local contraction hardly perceptible.

Diameter at fracture, ″.85. Area, .442 square inch. Contractio 11.6 per cent.

Elongation of inch sections, ″.05, ″.09, ″.12*, ″.08, ″.06.

No. 1967.

Marks, 10–334.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0478 in 6 inches.
Estimated temperature, 1362° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
2,000	4,000	.0032	.....	No apparent elastic limit.
.....	.....	.0037	.....	After 1 minute.
3,000	6,000	.0052	.....	
.....	.....	.0058	.....	After 1 minute.
.....	.....	.0062	.....	After 2 minutes.
.....	.....	.0066	.....	After 3 minutes.
.....	.....	.0069	.....	After 4 minutes.
.....	.....	.0071	.....	After 5 minutes.
4,000	8,000	.0084	.....	
.....	.....	.0092	.....	After 1 minute.
.....	.....	.0097	.....	After 2 minutes.
.....	.....	.0102	.....	After 3 minutes.
.....	.....	.0105	.....	After 4 minutes.
.....	.....	.0108	.....	After 5 minutes.
5,000	10,000	.0120	.....	
.....	.....	.0129	.....	After 1 minute.
.....	.....	.0135	.....	After 2 minutes.
.....	.....	.0140	.....	After 3 minutes.
.....	.....	.0146	.....	After 4 minutes.
.....	.....	.0149	.....	After 5 minutes.
6,000	12,000	.0160	.....	
.....	.....	.0171	.....	After 1 minute.
.....	.....	.0181	.....	After 2 minutes.
.....	.....	.0190	.....	After 3 minutes.
.....	.....	.0196	.....	After 4 minutes.
.....	.....	.0202	.....	After 5 minutes.
7,000	14,000	.0216	.....	
.....	.....	.0232	.....	After 1 minute.
.....	.....	.0243	.....	After 2 minutes.
.....	.....	.0253	.....	After 3 minutes.
.....	.....	.0264	.....	After 4 minutes.
.....	.....	.0274	.....	After 5 minutes.
8,000	16,000	.0287	.....	
.....	.....	.0310	.....	After 1 minute.
.....	.....	.0333	.....	After 2 minutes.
.....	.....	.0353	.....	After 3 minutes.
.....	.....	.0381	.....	After 4 minutes.
.....	.....	.0411	.....	After 5 minutes.
.....	.....	.0433	.....	After 6 minutes.
.....	.....	.0478	.....	After 7 minutes.
.....	.....	.0520	.....	After 8 minutes.
.....	.....	.0567	.....	After 9 minutes.
.....	.....	.0614	.....	After 10 minutes.

Hot test discontinued.
Bar rested 40 hours, and test then completed at temperature of 70° Fahr.
Total elongation, ″.04 = 0.8 per cent.
Elongation of inch sections, ″.00½, ″.01, ″.01, ″.01, ″.00½.
Minimum diameter, ″.791. Area, .491 square inch. Contraction, 1.8 per cent.

No. 1967—Continued.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	.....	0.	0.	Initial load.
5,000	.....	.0012	.....	
10,000	.....	.0033	.....	
15,000	.....	.0055	.....	
20,000	.....	.0068	.....	
25,000	.....	.0082	.....	
30,000	.....	.0095	.....	
35,000	.....	.0108	.....	
36,000	.....	.0109	.....	Elastic limit.
	.....	.0139	.....	
	72,600	.....	.....	On original area.
	73,320	.....	.....	On reduced area.
37,000	.....	.0161	.....	
38,000	.....	.0193	.....	
39,000	.....	.0219	.....	
40,000	.....	.0243	.....	
42,000	.....	.0360	.....	
46,000	.....	.0531	.....	
50,000	.....	.0708	.....	
54,000	.....	.0891	.....	
58,000	.....	.11	.....	
62,000	.....	.145	.....	
66,000	.....	.20	.....	
68,000	.....	.255	.....	
68,200	.....	.285	.....	Tensile strength.
	136,400	.....	.....	On original area.
	138,900	.....	.....	On reduced area.
67,500	161,100	.....	.....	At time of fracture.
0	0	.32	.....	=6.4 per cent. total elongation.

Fractured 2″.65 from neck. Appearance, granular, radiating from a small dull spot at the circumference.

Local contraction, 1″.5 each side of fracture.

Diameter at fracture, ″.73. Area, .419 square inch. Contraction, 16.2 per cent.

Elongation of inch sections, ″.03, ″.05, ″.15*, ″.06, ″.03.

No. 1951.

Marks, 10–334.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0486 in 6 inches.
Estimated temperature, 1384° Fahr.
Ganged length, 5″.

Applied loads.		In ganged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
2,000	4,000	.0015	.....	
3,000	6,000	.0037	.....	
4,000	8,000	.0057	.....	
5,000	10,000	.0076	.....	
6,000	12,000	.0095	.....	
7,000	14,000	.0117	.....	
8,000	16,000	.0131	.....	
9,000	18,000	.0148	.....	Elastic limit.
10,000	20,000	.0174	.....	
11,000	22,000	.0209	.....	
12,000	24,000	.0254	.....	
13,000	26,000	.0315	.....	
14,000	28,000	.0343	.....	
15,000	30,000	.0403	.....	
16,000	32,000	.0502	.....	
17,000	34,000	.0614	.....	
18,000	36,000	.0740	.....	
19,000	38,000	.0888	.....	
20,000	40,000	.1406	.....	
20,600	41,200	.1773	.....	Tensile strength.
15,500	43,900	.....	.....	At time of fracture.
0	0	.38	.....	=7.6 per cent.

Fractured ″.60 from neck. Appearance, spongy. Surface of fracture and stem, dark-blue color.

Local contraction extends to the neck, and 1″ from the fracture.

Diameter at fracture, ″.67 Area, .353 square inch. Contraction, 29.4 per cent.

Elongation of inch sections, ″.05, ″.02, ″.02, ″.04, ″.25*.

No. 1966.

Marks, 10–334.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0531 in 6 inches.
Estimated temperature, 1505° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
.....	.....	.....	.....	No apparent elastic limit.
.....	.....	.0004	.....	After 2 minutes.
.....	.....	.0005	.....	After 3 minutes.
.....	.....	.0006	.....	After 4 minutes.
.....	.....	.0007	.....	After 5 minutes.
1,500	3,000	.0015	.....	
.....	.....	.0017	.....	After 1 minute.
.....	.....	.0020	.....	After 2 minutes.
2,000	4,000	.0031	.....	
.....	.....	.0036	.....	After 1 minute.
.....	.....	.0041	.....	After 2 minutes.
.....	.....	.0043	.....	After 3 minutes.
.....	.....	.0045	.....	After 4 minutes.
.....	.....	.0048	.....	After 5 minutes.
2,500	5,000	.0059	.....	
.....	.....	.0064	.....	After 1 minute.
.....	.....	.0069	.....	After 2 minutes.
.....	.....	.0073	.....	After 3 minutes.
.....	.....	.0077	.....	After 4 minutes.
.....	.....	.0081	.....	After 5 minutes.
3,000	6,000	.0093	.....	
.....	.....	.0099	.....	After 1 minute.
.....	.....	.0105	.....	After 2 minutes.
.....	.....	.0110	.....	After 3 minutes.
.....	.....	.0116	.....	After 4 minutes.
.....	.....	.0121	.....	After 5 minutes.
3,500	7,000	.0130	.....	
.....	.....	.0139	.....	After 1 minute.
.....	.....	.0148	.....	After 2 minutes.
.....	.....	.0155	.....	After 3 minutes.
.....	.....	.0162	.....	After 4 minutes.
.....	.....	.0168	.....	After 5 minutes.
4,000	8,000	.0183	.....	
.....	.....	.0197	.....	After 1 minute.
.....	.....	.0204	.....	After 2 minutes.
.....	.....	.0213	.....	After 3 minutes.
.....	.....	.0223	.....	After 4 minutes.
.....	.....	.0232	.....	After 5 minutes.
4,500	9,000	.0247	.....	
.....	.....	.0261	.....	After 1 minute.
.....	.....	.0272	.....	After 2 minutes.
.....	.....	.0285	.....	After 3 minutes.
.....	.....	.0297	.....	After 4 minutes.
.....	.....	.0308	.....	After 5 minutes.
5,000	10,000	.0325	.....	
.....	.....	.0341	.....	After 1 minute.
.....	.....	.0357	.....	After 2 minutes.
.....	.....	.0376	.....	After 3 minutes.
.....	.....	.0390	.....	After 4 minutes.
.....	.....	.0405	.....	After 5 minutes.
.....	.....	.0477	.....	After 10 minutes.
.....	.....	.0547	.....	After 15 minutes.
.....	.....	.0619	.....	After 20 minutes.
.....	.....	.0690	.....	After 25 minutes.
.....	.....	.0764	.....	After 30 minutes.
.....	.....	.0831	.....	After 35 minutes.
.....	.....	.0900	.....	After 40 minutes.
.....	.....	.0975	.....	After 45 minutes.
.....	.....	.1059	.....	After 50 minutes.
.....	.....	.1141	.....	After 55 minutes.
.....	.....	.1219	.....	After 60 minutes.

Hot test discontinued.

No. 1966.—Continued.

Length of 6-inch section hot	inches..	6.1612
Length of 6-inch section cold	do....	6.1076
Contraction	do....	.0536

Estimated temperature at close of test, 1494° Fahr.
Total elongation, ″.10 = 2.0 per cent.
Elongation of inch sections, ″.01, ″.02, ″.03, ″.02, ″.02.
Minimum diameter, ″.775. Area, .472 square inch. Contraction, 5.6 per cent.
Rested 16 hours; test then completed at temperature of 70° Fahr.
Gauged length, 5″.10
Mean sectional area, .490 square inch.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	.....	0.	0.	Initial load.
5,000	.....	.0013	.....	
10,000	.....	.0023	.....	
15,000	.....	.0047	.....	
20,000	.....	.0064	.....	
25,000	.....	.0083	.....	
29,500	.....	.....	.....	Elastic limit.
	59,000	.....	.....	On original area.
	62,500	.....	.....	On reduced area.
30,000	.....	.0132	.0027	
31,000	.....	.0155	.....	
32,000	.....	.0184	.....	
33,000	.....	.0208	.....	
34,000	.....	.0238	.....	
35,000	.....	.0269	.....	
36,000	.....	.0300	.....	
38,000	.....	.0392	.....	
40,000	.....	.0508	.....	
42,000	.....	.06	.....	
44,000	.....	.08	.....	
46,000	.....	.09	.....	
48,000	.....	.10	.....	
50,000	.....	.12	.....	
52,000	.....	.13	.....	
54,000	.....	.15	.....	
56,000	.....	.175	.....	
58,000	.....	.22	.....	
59,060	.....	.26	.....	Tensile strength.
	118,120	.....	.....	On original section.
	125,130	.....	.....	On reduced section.
58,300	151,430	.....	.....	At time of fracture.
0	0	.38	.....	=7.6 per cent. total elongation.

Fractured at the middle of stem. Appearance, granular, radiating from a dull spot at the circumference.
Local contraction, 1″.6 each side of fracture.
Diameter at fracture, ″.70. Area, .385 square inch. Contraction [illegible] per cent.
[illegible]ngation of inch sections, ″.02, ″.06, ″.23*, ″.06, ″.01.

No. 1973.

Marks, 10–334.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0533 in 6 inches.
Estimated temperature, 1511° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
2,000	4,000	.0030	.....	No apparent elastic limit.
3,000	6,000	.0056	.....	
4,000	8,000	.0094	.....	
5,000	10,000	.0128	.....	
6,000	12,000	.0162	.....	
7,000	14,000	.0194	.....	
8,000	16,000	.0233	.....	
9,000	18,000	.0272	.....	
10,000	20,000	.0315	.....	
11,000	22,000	.0415	.....	
12,000	24,000	.0520	.....	
13,000	26,000	.0710	.....	
13,800	27,600	.1092	.....	
14,000	28,000	.1460	.....	
14,040	28,080	.17	.....	Tensile strength.
0	0	.94	.....	=18.8 per cent.

Fractured at middle of stem. Appearance, dull, silky. Surface of fracture and stem, blue black.

Local contraction, 1″.9 each side of fracture.

Diameter at fracture, ″.55. Area, .238 square inch. Contraction, 52.4 per cent.

Elongation of inch sections, ″.03, ″.14, ″.63*, ″.10, ″.04.

No. 1955.

Marks, 10–334.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0580 in 6 inches.
Estimated temperature, 1638° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
1,500	3,000	.0017	.....	
2,000	4,000	.0038	.....	No apparent elastic limit.
2,500	5,000	.0073	.....	
3,000	6,000	.0100	.....	
4,000	8,000	.0136	.....	
5,000	10,000	.0186	.....	
6,000	12,000	.0312	.....	
7,000	14,000	.0468	.....	
8,000	16,000	.0672	.....	
9,000	18,000	.1161	.....	
9,300	18,600	.1653	.....	Tensile strength.
0	0	1.19	.....	= 23.8 per cent.

Fractured 2″.90 from neck. Appearance, spongy. Surface of fracture and stem, blue color.

Local contraction, 1″.75 each side of fracture.

Diameter at fracture, ″.52. Area, .212 square inch. Contraction, 57.6 per cent.

Elongation of inch sections, ″.08, ″.22, ″.71*, ″.13, ″.05.

No. 1956.

Marks, 10–334.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0599 in 6 inches.
Estimated temperature, 1689° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
		.0003		After 1 minute.
1,500	3,000	.0016		No apparent elastic limit.
		.0030		After 1 minute.
2,000	4,000	.0049		
		.0064		Do.
2,500	5,000	.0081		
		.0104		Do.
3,000	6,000	.0121		
		.0153		Do.
		.0178		After 2 minutes.
		.0200		After 3 minutes.
		.0322		After 10 minutes.
		.0467		After 20 minutes.
		.0602		After 30 minutes.
		.0732		After 40 minutes.
		.0867		After 50 minutes.
		.1006		After 60 minutes.
		.1144		After 70 minutes.
		.1278		After 80 minutes.
		.1409		After 90 minutes.
		.1543		After 100 minutes.
		.1679		After 110 minutes.
		.1813		After 120 minutes.
		.1956		After 130 minutes.
		.2098		After 140 minutes.
		.2238		After 150 minutes.
		.2381		After 160 minutes.
		.2529		After 170 minutes.
		.2678		After 180 minutes.
		.2826		After 190 minutes.
		.2975		After 200 minutes.
				Test discontinued and bar allowed to cool.
0	0	.28		= 5.6 per cent.

Elongation of inch sections, ″.03, ″.05, ″.08, ″.07, ″.05.
Minimum diameter, ″.768. Area, .463 square inch. Contraction, 7.4 per cent.
Bar rested 115 hours and test completed at temperature of 70°.
Gauged length, 5″.28.
Mean sectional area, .473 square inch.

No. 1956—Continued.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	.....	0.	0.	Initial load.
5,000	.....	.0012	.....	
10,000	.....	.0032	.....	E=28,620,000 lbs. between 5,000 and 25,000 lbs.
15,000	.....	.0050	.....	
20,000	.....	.0069	.....	
25,000	.....	.0090	.....	
26,200	.....	.....	.....	Elastic limit.
	53,400	.....	.....	On original area.
	56,500	.....	.....	On reduced area.
Load fell.				
25,500	.....	.0146	.....	
26,000	.....	.0162	.....	
27,000	.....	.0228	.....	
28,000	.....	.0290	.....	
29,000	.....	.0360	.....	
30,000	.....	.0428	.....	
32,000	.....	.0551	.....	
34,000	.....	.0670	.....	
36,000	.....	.0827	.....	
38,000	.....	.1065	.....	
40,000	.....	.1150	.....	
42,000	.....	.1335	.....	
44,000	.....	.16	.....	
46,000	.....	.19	.....	
48,000	.....	.23	.....	
50,000	.....	.30	.....	
51,050	.....	.43	.....	Tensile strength.
	102,100	.....	.....	On original area.
	110,260	.....	.....	On reduced area.
0	0	.70	.....	=14.0 per cent. total elongation.

Fractured 2″.45 from neck. Appearance, granular, radiating from a dull spot at the circumference.

Local contraction, 1″.25 and 2″.00 on either side of fracture.

Diameter at fracture, ″.68. Area, .363 square inch. Contraction, 27.4 per cent.

Elongation of inch sections, ″.05, ″.10, ″.29*, ″.19, ″.07.

No. 1964.

Marks, 10–334.
Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0597 in 6 inches.
Estimated temperature, 1694° Fahr.
Gauged length, 5″.

Applied loads.		In ganged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
				No apparent elastic limit.
1,000	2,000	.0016	.....	After 1 minute.
.....	.....	.0028	.....	After 2 minutes.
.....	.....	.0038	.....	After 3 minutes.
.....	.....	.0043	.....	After 4 minutes.
.....	.....	.0048	.....	After 5 minutes.
.....	.....	.0055	.....	After 6 minutes.
.....	.....	.0058	.....	After 7 minutes.
.....	.....	.0064	.....	After 8 minutes.
.....	.....	.0069	.....	After 9 minutes.
.....	.....	.0074	.....	After 10 minutes.
.....	.....	.0093	.....	After 15 minutes.
.....	.....	.0107	.....	After 20 minutes.
.....	.....	.0120	.....	After 25 minutes.
.....	.....	.0134	.....	After 30 minutes.
.....	.....	.0145	.....	After 35 minutes.
.....	.....	.0156	.....	After 40 minutes.
.....	.....	.0166	.....	After 45 minutes.
.....	.....	.0174	.....	After 50 minutes.
.....	.....	.0182	.....	After 55 minutes.
.....	.....	.0189	.....	After 60 minutes.
2,000	4,000	.0213	.....	
.....	.....	.0228	.....	After 1 minute.
.....	.....	.0243	.....	After 2 minutes.
.....	.....	.0255	.....	After 3 minutes.
.....	.....	.0265	.....	After 4 minutes.
.....	.....	.0275	.....	After 5 minutes.
.....	.....	.0285	.....	After 6 minutes.
3,000	6,000	.0311	.....	
.....	.....	.0361	.....	After 1 minute.
.....	.....	.0389	.....	After 2 minutes.
.....	.....	.0425	.....	After 3 minutes.
.....	.....	.0449	.....	After 4 minutes.
.....	.....	.0576	.....	After 5 minutes.
.....	.....	.0503	.....	After 6 minutes.
.....	.....	.0527	.....	After 7 minutes.
.....	.....	.0549	.....	After 8 minutes.
.....	.....	.0573	.....	After 9 minutes.
.....	.....	.0599	.....	After 10 minutes.
.....	.....	.0682	.....	After 15 minutes.
.....	.....	.0778	.....	After 20 minutes.
.....	.....	.0887	.....	After 25 minutes.
.....	.....	.1005	.....	After 30 minutes.
.....	.....	.1097	.....	After 35 minutes.
.....	.....	.1187	.....	After 40 minutes.

Hot test discontinued.

Length of 6-inch section, hot.....inches.. 6.1
Length of 6-inch section, cold.....do.... 6.1

Contraction.....do.... 0.

Estimated temperature at close of test, 1764° Fahr.
Total elongation, ″.10 = 2.0 per cent.
Elongation of inch sections, ″.01, ″.03, ″.03, ″.02, ″.01.
Minimum diameter, ″.7873. Area, .487 square inch. Contracti
2.6 per cent.
Rested 40 hours and test then completed at temperature of 75° F.

No. 1964—Continued.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	.....	0.	0.	Initial load.
5,000	.....	.0038	.....	
10,000	.....	.0063	.....	
15,000	.....	.0088	.....	
20,000	.....	.0099	.....	
25,000	.....	.0115	.....	
30,000	.....	.0132	.....	Elastic limit.
	60,000	.....	.....	On original area.
	61,600	.....	.....	On reduced area.
Load fell.				
29,000	.....	.0212	.....	
29,500	.....	.0237	.....	
30,000	.....	.0258	.....	
31,000	.....	.0322	.....	
32,000	.....	.0392	.....	
33,000	.....	.0438	.....	
34,000	.....	.0496	.....	
36,000	.....	.0601	.....	
38,000	.....	.0715	.....	
40,000	.....	.0825	.....	
42,000	.....	.0960	.....	
44,000	.....	.1104	.....	
46,000	.....	.1271	.....	
48,000	.....	.15	.....	
50,000	.....	.17	.....	
52,000	.....	.20	.....	
54,000	.....	.25	.....	
56,000	.....	.30	.....	
57,000	.....	.38	.....	
57,180	.....	.45	.....	Tensile strength.
	114,360	.....	.....	On original area.
	117,410	.....	.....	On reduced area.
55,800	144,940	.....	.....	At time of fracture.
0	0	.60	.....	= 12.0 per cent.

Fractured at middle of stem. Appearance, granular, radiating from a dull spot in the circumference.

Local contraction, .″15 each side of fracture.

Diameter at fracture, ″.70. Area, .385 square inch. Contraction, 23.0 per cent.

Elongation of inch sections, ″.04, ″.10, ″.29*, ″.12, ″.05.

RE-TESTS AT HIGH TEMPERATURES

OF

SPECIMENS FROM A WROUGHT-IRON BAR.

ORIGINAL TESTS MADE SEVEN YEARS PREVIOUS, AT WHICH TIME THE METAL EXHIBITED AN ELASTIC LIMIT OF 32,000 POUNDS PER SQUARE INCH, AND WAS LOADED WITH 42,320 POUNDS PER SQUARE INCH, WHICH ELONGATED THE METAL 5.2 PER CENT.

No. 1912.

Wrought iron A.

Diameter, ".798.
Sectional area, .50 square inch.
Temperature, 70° Fahr.
Guaged length, 5".

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
5,000	10,000	.0014	.....	[load.
10,000	20,000	.0032	.....	E = 26,320,000 lbs. between 5,000 and 20,000 lbs.
15,000	30,000	.0051	.....	
20,000	40,000	.0070	—.0001	
21,000	42,000	.0075	.....	
22,000	44,000	.0078	.....	
22,500	45,000	.0080	.....	Elastic limit.
23,000	46,000	.0088	.....	
23,500	47,000	.0106	.....	
24,000	48,000	.0133	.....	
25,000	50,000	.0205	.0115	
26,000	52,000	.03	.....	
27,000	54,000	.05	.....	
28,000	56,000	.12	.....	
29,000	58,000	.18	.....	
30,000	60,000	.26	.....	
30,590	61,180	.38	.....	Tensile strength.
28,400	83,040	.....	.....	At time of fracture.
0	0	.49	.....	= 9.8 per cent.

Fractured ".40 from neck. Appearance, fibrous, trace of granulation. Local contraction extends to the neck, and ".80 from fracture.

Diameter at fracture, ".66. Area, .342 square inch. Contraction, 31.6 per cent.

Elongation of inch sections, ".26*, ".07, ".06, ".05, ".05.

No. 1920.

Wrought iron A.

Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0096 in 6 inches.
Estimated temperature, 308° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
5,000	10,000	.0026	.....	
10,000	20,000	.0036	.....	
15,000	30,000	.0052	.....	
25,000	50,000	.0069	.....	
26,000	52,000	.0071	.....	Elastic limit.
27,000	54,000	.0080	.....	
27,400	54,800	.....	.....	
Load fell.				
27,400	54,800	.0127	.....	Throbs.
28,000	56,000	.0544	.....	
29,000	58,000	.0674	.....	
30,000	60,000	.0925	.....	
31,000	62,000	.1585	.....	
32,000	64,000	.1734	.....	
33,000	66,000	.2144	.....	
33,200	66,400	.2289	.....	Tensile strength.
0	0	.41	.....	= 8.2 per cent.

Fractured ″.65 from neck. Appearance, fibrous; no change in color. Surface of stem straw color.

Local contraction extends to the neck, and 1″.00 from the fracture.

Diameter at fracture, ″.71. Area, .396 square inch. Contraction, 20.8 per cent.

Elongation of inch sections, ″.03, ″.05, ″.05, ″.08, ″.20*.

No. 1913.

Wrought iron A.

Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0202 in 6 inches.
Estimated temperature, 570° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
5,000	10,000	.0034	.....	
10,000	20,000	.0049	.....	
15,000	30,000	.0074	.....	
20,000	40,000	.0096	.....	
21,000	42,000	.0102	.....	
22,000	44,000	.0105	.....	Elastic limit.
23,000	46,000	.0115	.....	
24,000	48,000	.0125	.....	
26,000	52,000	.0162	.....	
27,000	54,000	.0345	.....	
28,000	56,000	.0533	.....	
29,000	58,000	.0819	.....	
30,000	60,000	.1106	.....	
31,000	62,000	.1444	.....	
32,000	64,000	.1953	.....	
33,000	66,000	.27	.....	
34,000	68,000	.355	.....	
35,000	70,000	.535	.....	Tensile strength.
34,100	83,780	.....	.....	At time of fracture.
0	0	.65	.....	= 13.0 per cent.

Fractured at middle of stem. Appearance, fibrous, dark-purple color. Surface of stem, straw color with purple hue.

Local contraction, ″.70 each side of fracture.

Diameter at fracture, ″.72. Area, .407 square inch. Contraction, 18.6 per cent.

Elongation of inch sections, ″.08, ″.15, ″.25*, ″.10, ″.08.

No. 1915.

Wrought iron A.

Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0250 in 6 inches.
Estimated temperature, 689° Fahr.
Gauged length, 5′.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
5,000	10,000	.0031	.....	
10,000	20,000	.0049	.....	
15,000	30,000	.0076	.....	
20,000	40,000	.0111	.....	
21,000	42,000	.0121	.....	
22,000	44,000	.0131	.....	
23,000	46,000	.0145	.....	Elastic limit.
24,000	48,000	.0180	.....	
25,000	50,000	.0304	.....	
26,000	52,000	.0538	.....	
27,000	54,200	.0874	.....	
28,000	56,000	.1259	.....	
29,000	58,000	.1780	.....	
30,000	60,000	.2732	.....	
31,000	62,000	.475	.....	Tensile strength.
0	0	.64	.....	= 12.8 per cent.

Fractured 1″.00 from neck. Appearance, fibrous oblique; dark-blue color. Surface of stem, dark blue with a bronze cast.

Local contraction, 1″.00 each side of fracture.

Diameter at fracture, ″.71. Area, .396 square inch. Contraction, 20.8 per cent.

Elongation of inch sections, ″.28*, ″.13, ″.10, ″.08, ″.05.

No. 1916.

Wrought iron A.

Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0331 in 6 inches.
Estimated temperature, 889° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
5,000	10,000	.0047	.....	
10,000	20,000	.0071	.....	
15,000	30,000	.0103	.....	
16,000	32,000	.0113	.....	
17,000	34,000	.0124	.....	
18,000	36,000	.0131	.....	Elastic limit.
19,000	38,000	.0146	.....	
20,000	40,000	.0176	.....	
21,000	42,000	.0251	.....	
22,000	44,000	.0485	.....	
23,000	46,000	.0813	.....	
24,000	48,000	.1321	.....	
25,000	50,000	.2314	.....	
26,000	52,000	.41	.....	Tensile strength.
23,700	61,560	.....	.....	At time of fracture.
0	0	.79	.....	=15.8 per cent.

Fractured 1″.00 from neck. Appearance, fibrous. Surfaces, blue black.

Local contraction, ″.8 each side of fracture.

Diameter at fracture, ″.70. Area, .385 square inch. Contraction, 23.0 per cent.

Elongation of inch sections, ″.28*, ″.20, ″.13, ″.10, ″.08.

No. 1917.

Wrought iron A.

Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0372 in 6 inches.
Estimated temperature, 991° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
5,000	10,000	.0047	.....	
10,000	20,000	.0082	.....	
11,000	22,000	.0091	.....	
12,000	24,000	.0103	.....	Elastic limit.
13,000	26,000	.0126	.....	
14,000	28,000	.0143	.....	
15,000	30,000	.0212	.....	
16,000	32,000	.0426	.....	
17,000	34,000	.0777	.....	
18,000	36,000	.1456	.....	
18,580	37,160	.30	.....	Tensile strength.
15,700	45,910	.....	.....	At time of fracture.
0	0	.95	.....	=19.0 per cent.

Fractured 2″.75 from neck. Appearance, fibrous. Surfaces of fracture and stem, blue black.

Local contraction, 1″.3 each side of fracture.

Diameter at fracture, ″.66. Area, .342 square inch. Contraction, 31.6 per cent.

Elongation of inch sections, ″.05, ″.13, ″.42*, ″.28, ″.07.

No. 1914.

Wrought iron A.

Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0442 in 6 inches.
Estimated temperature, 1164° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
2,000	4,000	.0016	.....	
3,000	6,000	.0035	.....	
4,000	8,000	.0049	.....	
5,000	10,000	.0071	.....	
6,000	12,000	.0091	.....	
7,000	14,000	.0111	.....	Elastic limit.
8,000	16,000	.0147	.....	
9,000	18,000	.0238	.....	
10,000	20,000	.0534	.....	
10,420	20,840	.1446	.....	Tensile strength.
		.29	.....	
10,200	31,680	.....	.....	At time of fracture.
0	0	.97	.....	= 19.4 per cent.

Fractured 2″.8 from neck. Appearance, fibrous; surface of fracture and stem, blue black.

Local contraction, 2″.00 each side of fracture.

Diameter at fracture, ″.64. Area, .322 square inch. Contraction, 35.6 per cent.

Elongation of inch sections, ″.07, ″.27, ″.48*, ″.13, ″.02.

No. 1918.

Wrought iron, A.

Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0506 in 6 inches.
Estimated temperature, 1322° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
1,500	3,000	.0015	.....	
2,000	4,000	.0028	.....	
2,500	5,000	.0044	.....	
3,000	6,000	.0055	.....	
3,500	7,000	.0070	.....	
4,000	8,000	.0088	.....	
4,500	9,000	.0104	.....	Elastic limit.
5,000	10,000	.0130	.....	
5,500	11,000	.0167	.....	
6,000	12,000	.0247	.....	
6,500	13,000	.0383	.....	
7,000	14,000	.0627	.....	
7,270	14,540	.1276	.....	Tensile strength.
7,000	.....	.32	.....	Observation while load was falling.
0	0	.92	.....	= 18.4 per cent.

Fractured 2″.70 from neck. Appearance, fibrous. Surfaces of fracture and stem, blue black.

Local contraction, 1″.6 each side of fracture.

Diameter at fracture, ″.61. Area, .292 square inch. Contraction, 41.6 per cent.

Elongation of inch sections, ″.03, ″.26, ″.53*, ″.08, ″.02.

No. 1919.

Wrought iron, A.

Diameter, ″.794.
Sectional area, .495 square inch.
Expansion, ″.0605 in 6 inches.
Estimated temperature, 1568° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,020	0.	0.	Initial load.
1,500	3,030	.0032	.....	No apparent elastic limit.
2,000	4,040	.0085	.....	
2,500	5,050	.0209	.....	
3,000	6,060	.0419	.....	
3,180	6,420	.0928	.....	Tensile strength.
0	0	.60	.....	= 12.0 per cent.

Fractured 2″.5 from neck. Appearance, fibrous, spongy. Surface cracks in vicinity of place of rupture. Surfaces of fracture and stem, blue-black.

Local contraction, 1″.4 each side of fracture.

Diameter at fracture, ″.65. Area, .332 square inch. Contraction, 32.9 per cent.

Elongation of inch sections, ″.01, ″.15, ″.38*, ″.04, ″.02.

No. 1825.

Wrought iron, MB_5.

Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0062 in 6 inches.
Estimated temperature, 195° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
10,000	20,000	.0024	.....	
11,000	22,000	.0028	.....	
12,000	24,000	.0031	.....	
13,000	26,000	.0036	.....	
13,400	26,800	.....	.....	Elastic limit.
		Load fell.		
13,000	26,000	.0147	.....	
		.0384	.....	
14,000	28,000	.0425	.....	
15,000	30,000	.0741	.....	
16,000	32,000	.0935	.....	
17,000	34,000	.1055	.....	
18,000	36,000	.1308	.....	
19,000	38,000	.1472	.....	
20,000	40,000	.17	.....	
21,000	42,000	.20	.....	Throbs.
22,000	44,000	.24	.....	
23,000	46,000	.265	.....	
24,000	48,000	.30	.....	
25,000	50,000	.465	.....	
25,780	51,560	.68	.....	Tensile strength.
23,700	81,160	.....	.....	At time of fracture.
0	0	.86	.....	=17.2 per cent.

Fractured ″.90 from neck. Appearance, fibrous.
Local contraction, ″.9 each side of fracture.
Diameter at fracture, ″.61. Area, .292 square inch. Contraction, 41.6 per cent.
Elongation of inch sections, ″.07, ″.10, ″.15, ″.16, ″.38*.

No. 1826.

Wrought iron, MB_s.

Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0125 in 6 inches.
Estimated temperature, 379° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
10,000	20,000	.0030	.....	
11,000	22,000	.0035	.....	
12,000	24,000	.0041	.....	Elastic limit.
13,000	26,000	.0055	.....	
		Load fell.		
12,500	25,000	.0165	.....	
		.0235	.....	
13,000	26,000	.0240	.....	
14,000	28,000	.0390	.....	
15,000	30,000	.0524	.....	
16,000	32,000	.0678	.....	
17,000	34,000	.0776	.....	
18,000	36,000	.0901	.....	
19,000	38,000	.1035	.....	
20,000	40,000	.1171	.....	
21,000	42,000	.1331	.....	
22,000	44,000	.1501	.....	
23,000	46,000	.1701	.....	
24,000	48,000	.1886	.....	
25,000	50,000	.2111	.....	
26,000	52,000	.2301	.....	
28,000	56,000	.305	.....	
30,000	60,000	.385	.....	
30,400	60,800	.43	.....	Throbs.
31,000	62,000	.515	.....	
32,000	64,000	.645	.....	
32,300	64,600	.76	.....	Tensile strength.
30,800	87,250	.....	.....	At time of fracture.
0	0	.85	.....	=17.0 per cent.

Fractured ″.90 from neck. Appearance, fibrous; oblique 60°. No change in color. Surface of stem, mottled straw color.

Local contraction, ″.7 each side of fracture.

Diameter at fracture, ″.67. Area, .353 square inch. Contraction, 29.4 per cent.

Elongation of inch sections, ″.13, ″.13, ″.14, ″.16, ″.29*.

No. 1824.

Wrought iron, MB_3.

Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0200 in 6 inches.
Estimated temperature, 565° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
5,000	10,000	.0014	.....	
6,000	12,000	.0020	.....	
7,000	14,000	.0027	.....	
8,000	16,000	.0033	.....	Elastic limit.
9,000	18,000	.0056	.....	
10,000	20,000	.0093	.....	
11,000	22,000	.0155	.....	
12,000	24,000	.0267	.....	
13,000	26,000	.0387	.....	
14,000	28,000	.0542	.....	
15,000	30,000	.0683	.....	
16,000	32,000	.0870	.....	
17,000	34,000	.1005	.....	
18,000	36,000	.1143	.....	
19,000	38,000	.1322	.....	
20,000	40,000	.1523	.....	
21,000	42,000	.175	.....	
22,000	44,000	.195	.....	
23,000	46,000	.225	.....	
24,000	48,000	.25	.....	
25,000	50,000	.285	.....	
26,000	52,000	.32	.....	
27,000	54,000	.38	.....	
28,000	56,000	.435	.....	
29,000	58,000	.51	.....	
30,000	60,000	.605	.....	
31,000	62,000	.795	.....	
31,180	62,360	.89	.....	Tensile strength.
29,200	80,440	.....	.....	At time of fracture.
0	0	1.04	.....	=20.8 per cent.

Fractured 2″.75 from neck. Appearance, fibrous; oblique 55°; dark-purple color. Surface of stem, light-blue color.

Local contraction, ″.7 each side of fracture.

Diameter at fracture, ″.68. Area, .363 square inch. Contraction, 27.4 per cent.

Elongation of inch sections, ″.14, ″.20, ″.35*, ″.18, ″.17.

No. 1827.

Wrought iron, MB_5.

Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0300 in 6 inches.
Estimated temperature, 813° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds	*Pounds.*	*Inches.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
5,000	10,000	.0018	.....	
6,000	12,000	.0025	.....	
7,000	14,000	.0036	.....	Elastic limit.
8,000	16,000	.0059	.....	
9,000	18,000	.0107	.....	
10,000	20,000	.0179	.....	
11,000	22,000	.0287	.....	
12,000	24,000	.0409	.....	
13,000	26,000	.0571	.....	
14,000	28,000	.0746	.....	
15,000	30,000	.0960	.....	
16,000	32,000	.1144	.....	
17,000	34,000	.1374	.....	
18,000	36,000	.1662	.....	
19,000	38,000	.2041	.....	
20,000	40,000	.2747	.....	
21,000	42,000	.375	.....	
21,790	43,580	.60	.....	Tensile strength.
14,000	49,470	.....	.....	At time of fracture.
0	0	1.38	.....	= 27.6 per cent.

Fractured 2″.75 from neck. Appearance, fibrous. Surface of stem and fracture, blue-black color.
Local contraction, ″.9 each side of fracture.
Diameter at fracture, ″.60. Area, .283 square inch. Contraction, 43.4 per cent.
Elongation of inch sections, ″.19, ″.52*, ″.40, ″.17, ″.10.

No. 1900.

Wrought iron, B.

Diameter, ".798.
Sectional area, .50 square inch.
Temperature, 70° Fahr.
Gauged length, 5".

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inches.*	
1,000	2,000	0.	0.	Initial load.
5,000	10,000	.0013	.....	
10,000	20,000	.0029	.....	
11,000	22,000	.0032	.....	
12,000	24,000	.0035	.....	
13,000	26,000	.0039	.....	
14,000	28,000	.0043	.....	
15,000	30,000	.0047	.....	
15,280	30,560	.....	.....	Elastic limit.
Load fell.				
15,000	30,000	.1127	.....	
16,000	32,000	.1375	.....	
17,000	34,000	.1730	.....	
18,000	36,000	.2135	.....	
19,000	38,000	.265	.....	
20,000	40,000	.335	.....	
21,000	42,000	.425	.....	
22,000	44,000	.535	.....	
23,000	46,000	.78	.....	
23,500	47,000	1.04	.....	
23,570	47,140	1.32	.....	Tensile strength.
19,160	83,410	.....	.....	At time of fracture.
0	0	1.70	.....	=34.0 per cent.

Fractured 3" from the neck. Appearance, fibrous.
Local contraction, 1" each side of fracture.
Diameter at fracture, ".54. Area, .229 square inch. Contraction, 54.2 per cent.
Elongation of inch sections, ".23, ".35, ".62*, ".28, ".22.

No. 1911.

Wrought iron, B.

Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0044 in 6 inches.
Estimated temperature, 179° Fahr.
Ganged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
14,200	28,400	.0123	.....	Elastic limit.
15,000	30,000	.0217	.....	
16,000	32,000	.0350	.....	
17,000	34,000	.1619	.....	
18,000	36,000	.1765	.....	
19,000	38,000	.2259	.....	
20,000	40,000	.2727	.....	
21,000	42,000	.325	.....	
22,000	44,000	.36	.....	
23,000	46,000	.645	.....	
23,600	47,200	1.04	.....	Tensile strength.
0	0	1.23	.....	= 24.6 per cent.

Fractured 1″.40 from neck. Appearance, fibrous. No change in color.

Local contraction, 1″.25 each side of fracture.

Diameter at fracture, ″.58. Area, .264 square inch. Contraction, 47.2 per cent.

Elongation of inch sections, ″.17, ″.18, ″.18, ″.38, ″.32*.

No. 1852.

Wrought iron, B.

Diameter, .″798.
Sectional area, .50 square inch.
Expansion, ″.0064 in 6 inches.
Estimated temperature, 228° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
14,800	29,600	.....	.....	Elastic limit.
		Load fell.		
13,000	26,000	.0177	.....	
		.0497	.....	
14,000	28,000	.0572	.....	
15,000	30,000	.0683	.....	
16,000	32,000	.0872	.....	
17,000	34,000	.1050	.....	
18,000	36,000	.1246	.....	
19,000	38,000	.1460	.....	Throbs.
20,000	40,000	.1728	.....	
21,000	42,000	.2055	.....	
22,000	44,000	.2487	.....	
23,000	46,000	.3047	.....	
24,000	48,000	.375	.....	
25,000	50,000	.47	.....	
26,000	52,000	.595	.....	
26,200	52,400	.71	.....	
26,580	53,160	.87	.....	Tensile strength.
24,400	78,210	.....	.....	At time of fracture.
0	0	1.06	.....	= 21.2 per cent.

Fractured 2″ from the neck. Appearance, fibrous; oblique 70°. No change in color.

Local contraction, ″.6 each side of fracture.

Diameter at fracture, ″.63. Area, .312 square inch. Contraction, 37.6 per cent.

Elongation of inch sections, ″.09, ″.17, ″.23, ″.35*, ″.22.

No. 1850.

Wrought iron, B.

Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0075 in 6 inches.
Estimated temperature, 256° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
14,000	28,000	.0039	.....	Elastic limit.
		Load fell.		
13,000	26,000	.0594	.....	
14,000	28,000	.0620	.....	
15,000	30,000	.0725	.....	
16,000	32,000	.1059	.....	
17,000	34,000	.1070	.....	
18,000	36,000	.1273	.....	Throbs.
19,000	38,000	.1357	.....	
20,000	40,000	.1385	.....	
21,000	42,000	.2202	.....	
22,000	44,000	.2434	.....	
23,000	46,000	.3164	.....	
24,000	48,000	.4137	.....	
24,800	49,600	.585	.....	Tensile strength.
22,800	84,160	.....	.....	At time of fracture.
0	0	.88	.....	= 17.6 per cent.

Fractured ″.75 from neck. Appearance, fibrous. No change in color.
Local contraction extends to the neck, and ″.8 from fracture.
Diameter at fracture, ″.61. Area, .292 square inch. Contraction, 41.6 per cent.
Elongation of inch sections, ″.09, ″.11, ″.14, ″.16, ″.38*.

No. 1849.

Wrought iron, B.

Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0120 in 6 inches.
Estimated temperature, 367° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
12,000	24,000	.0021	.....	
13,000	26,000	.0023	.....	
14,000	28,000	.0028	.....	Elastic limit.
Load fell.				
12,500	25,000	.0221	.....	
13,000	26,000	.0373	.....	
13,500	27,000	.0390	.....	
14,000	28,000	.0407	.....	
14,500	29,000	.0469	.....	
15,000	30,000	.0500	.....	
16,000	32,000	.0617	.....	
17,000	34,000	.0720	.....	
18,000	36,000	.0831	.....	
19,000	38,000	.0970	.....	
20,000	40,000	.1128	.....	
21,000	42,000	.1270	.....	
22,000	44,000	.1467	.....	
23,000	46,000	.1657	.....	Throbs.
24,000	48,000	.2180	.....	
25,000	50,000	.2530	.....	
26,000	52,000	.2874	.....	
27,000	54,000	.36	.....	
28,000	56,000	.41	.....	
28,500	57,000	.47	.....	
29,000	58,000	.53	.....	
29,360	58,720	.60	.....	Tensile strength.
27,100	84,160	.....	.....	At time of fracture.
0	0	.87	.....	=17.4 per cent.

Fractured ″.80 from neck. Appearance, fibrous; oblique 60°; surface somewhat smooth. No change in color. Surface of stem, pale-straw color.

Local contraction extends to the neck and ″.9 from fracture.

Diameter at fracture, ″.64. Area, .322 square inch. Contraction, 35.6 per cent.

Elongation of inch sections, ″.12, ″.13, ″.15, ″.15, ″.32*.

No. 1910.

Wrought iron, B.

Diameter, ".798. Sectional area, .50 square inch. Expansion, ".0138 in 6 inches. Estimated temperature, 412° Fahr. Gauged length, 5".

Applied loads.		In ganged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
10,000	20,000	.0016	.....	
11,000	22,000	.0020	.....	
12,000	24,000	.0022	.....	
13,000	26,000	.0027 .0385	.....	Elastic limit.
14,000	28,000	.0502	.....	
15,000	30,000	.0571	.....	
16,000	32,000	.0770	.....	
17,000	34,000	.0785	.....	
18,000	36,000	.1017	.....	
Hot test discontinued.				
0	0	.11	.....	= 2.2 per cent.

Elongation of inch sections, ".02, ".02, ".02, ".03, ".02.
Minimum diameter, ".79. Area, .490 sq. in. Contraction, 2.0 p. ct.
Surface of stem, blue, shading into bronze hue.
Rested 40 hours; test then completed at temperature of 70° Fahr.
Gauged length, 5".11. Mean sectional area, .489 square inch.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	.....	0.	0.	Initial load.
5,000	.....	.0015	.....	
10,000	.....	.0034	.....	
15,000	.....	.0053	.....	
20,000	.....	.0071	.....	
20,700	.....	.....	.....	Elastic limit.
	41,400	.....	.....	On original area.
	42,240	.....	.....	On reduced area.
Load fell.				
19,400	.....	.0257	.....	
20,000	.....	.0555	.....	
21,000	.....	.0945	.....	
22,000	.....	.1370	.....	
23,000	.....	.18	.....	
24,000	.....	.26	.....	
24,500	.....	.30	.....	
25,000	.....	.37	.....	
25,500	.....	.49	.....	
25,820	.....	.84	.....	Tensile strength.
	51,670	.....	.....	On original area.
	52,690	.....	.....	On reduced area.
21,400	86,990	.....	.....	At time of fracture.
0	0	1.35	.....	= 27.0 per cent. total elongation.

Fractured 2".75 from the neck. Appearance, fibrous; color vari from dark to light.
Local contraction, 1" each side of fracture.
Diameter at fracture, ".56. Area, .246 sq. in. Contraction, 50.8 p.
Elongation of inch sections, ".17, ",36, ".47*, ",20, ".15.

No. 1851.

Wrought iron, B.

Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0164 in 6 inches.
Estimated temperature, 476° Fahr.
Ganged length, 5″.

Applied loads.		In ganged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
6,000	12,000	.0018	.....	
7,000	14,000	.0025	.....	Elastic limit.
8,000	16,000	.0038	.....	
9,000	18,000	.0071	.....	
10,000	20,000	.0144	.....	
11,000	22,000	.0205	.....	
12,000	24,000	.0313	.....	
13,000	26,000	.0420	.....	
14,000	28,000	.0515	.....	
15,000	30,000	.0626	.....	
16,000	32,000	.0750	.....	
17,000	34,000	.0889	.....	
18,000	36,000	.1059	.....	
19,000	38,000	.1268	.....	
20,000	40,000	.1376	.....	
22,000	44,000	.1795	.....	
23,000	46,000	.2005	.....	
24,000	48,000	.2308	.....	
25,000	50,000	.2608	.....	
26,000	52,000	.2992	.....	
27,000	54,000	.375	.....	
28,000	56,000	.425	.....	
29,000	58,000	.53	.....	
29,580	59,160	.72	.....	Tensile strength.
26,100	83,650	.....	.....	At time of fracture.
0	0	1.08	.....	= 21.6 per cent.

Fractured 1″.60 from neck. Appearance, fibrous; oblique 55°; bronze color. Surface of stem, bronze color, mottled.

Local contraction, ″.7 each side of fracture.

Diameter at fracture, ″.63. Area, .312 square inch. Contraction, 37.6 per cent.

Elongation of inch sections, ″.19, ″.41*, ″.19, ″.16, ″.13.

No. 1909.

Wrought iron, B.

Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0183 in 6 inches.
Estimated temperature, 523° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
2,000	4,000	.0005	.....	
3,000	6,000	.0012	.....	
4,000	8,000	.0017	.....	
5,000	10,000	.0019	.....	
6,000	12,000	.0031	.....	
7,000	14,000	.0041	.....	
8,000	16,000	.0062	.....	Elastic limit.
9,000	18,000	.0108	.....	
10,000	20,000	.0168	.....	
11,000	22,000	.0230	.....	
12,000	24,000	.0338	.....	
13,000	26,000	.0450	.....	
14,000	28,000	.0561	.....	
15,000	30,000	.0688	.....	
16,000	32,000	.0820	.....	
17,000	34,000	.0968	.....	
18,000	36,000	.1125	.....	
.....	.....	.1194	.....	After 1 minute.
.....	.....	.1212	.....	After 2 minutes.
.....	.....	.1224	.....	After 3 minutes.
.....	.....	.1234	.....	After 4 minutes.
.....	.....	.1242	.....	After 5 minutes.
.....	.....	.1250	.....	After 6 minutes.
.....	.....	.1255	.....	After 7 minutes.
.....	.....	.1261	.....	After 8 minutes.
.....	.....	.1265	.....	After 9 minutes.
.....	.....	.1271	.....	After 10 minutes.
Hot test discontinued.				
0	0	.13	.....	=2.6 per cent.

Elongation of inch sections, ″.02, ″.03, ″.03, ″.02, ″.03.
Minimum diameter, ″.790. Area, .490 square inch. Contraction, 2.0 per cent.
Surface of stem, blue, shading into bronze hue.
Rested 60 hours, and test then completed at temperature of 70° Fahr.
Gauged length, 5″.13.
Mean sectional area, .487 square inch.

No. 1909—Continued.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	.....	0.	0.	Initial load.
5,000	.....	.0015	.....	
10,000	.....	.0034	.....	E = 29,630,000 pounds between 5,000 and 20,000 pounds.
15,000	.....	.0052	.....	
20,000	.....	.0070	.0002	
21,000	.....	.0074	.....	
22,000	.....	.....	.....	Elastic limit.
	44,000	.....	.....	On original area.
	44,900	.....	.....	On reduced area.
Load fell.				
20,500	.....	.0208	.....	
21,000	.....	.0606	.....	
22,000	.....	.1095	.....	
23,000	.....	.1540	.....	
24,000	.....	.20	.....	
25,000	.....	.27	.....	
26,000	.....	.47	.....	
26,300	.....	.66	.....	Tensile strength.
	52,600	.....	.....	On original area.
	53,670	.....	.....	On reduced area.
22,200	87,060	.....	.....	At time of fracture.
0	0	1.25	.....	= 25.0 per cent. total elongation.

Fractured 1″.35 from neck. Appearance, fibrous.

Local contraction, 1″ each side of fracture.

Diameter at fracture ″.57. Area, .255 square inch. Contraction, 49.0 per cent.

Elongation of inch sections, ″.35*, ″.36*, ″.19, ″.18, ″.17.

No. 1906.

Wrought iron, B.

Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0194 in 6 inches.
Estimated temperature, 551° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
2,000	4,000	.0009	.....	
3,000	6,000	.0014	.....	
4,000	8,000	.0018	.....	
5,000	10,000	.0020	.....	
6,000	12,000	.0032	.....	
7,000	14,000	.0039	.....	Elastic limit.
8,000	16,000	.0064	.....	
9,000	18,000	.0106	.....	
10,000	20,000	.0166	.....	
11,000	22,000	.0249	.....	
12,000	24,000	.0347	.....	
13,000	26,000	.0455	.....	
14,000	28,000	.0581	.....	
15,000	30,000	.0706	.....	
16,000	32,000	.0844	.....	
17,000	34,000	.0987	.....	
18,000	36,000	.1168	.....	
.....	.....	.1212	.....	After 1 minute.
.....	.....	.1229	.....	After 2 minutes.
.....	.....	.1239	.....	After 3 minutes.
.....	.....	.1246	.....	After 4 minutes.
.....	.....	.1250	.....	After 5 minutes.
.....	.....	.1256	.....	After 6 minutes.
.....	.....	.1260	.....	After 7 minutes.
.....	.....	.1264	.....	After 8 minutes.
.....	.....	.1266	.....	After 9 minutes.
.....	.....	.1269	.....	After 10 minutes.
Hot test discontinued.				
0	0	.13	.....	=2.6 per cent.

Elongation of inch sections, ″.02, ″.03, ″.03, ″.03, ″.02.
Minimum diameter, ″.789. Area, .489 square inch. Contraction, 2.2 per cent.
Surface of stem, blue, shading into bronze-blue color.
Rested 48 hours; test then completed at temperature of 70° Fahr.
Gauged length, 5″.13.
Mean sectional area, .487 square inch.

No. 1906—Continued.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	.....	0.	0.	Initial load.
5,000	.....	.0015	.....	
10,000	.....	.0032	.....	E = 28,710,000 pounds between 5,000 and 20,000 pounds.
15,000	.....	.0050	.....	
18,000	.....	.0061	.....	
20,000	.....	.0070	.....	
21,000	.....	.0078	.....	
21,800	.....	.....	.....	Elastic limit.
	43,600	.....	.....	On original area.
	44,580	.....	.....	On reduced area.
Load fell.				
21,000	.....	.0335	.....	
21,500	.....	.0980	.....	
22,000	.....	.1140	.....	
23,000	.....	.15	.....	
24,000	.....	.22	.....	
25,000	.....	.32	.....	
25,500	.....	.38	.....	
26,000	.....	.51	.....	
26,220	.....	.74	.....	Tensile strength.
	52,440	.....	.....	On original area.
	53,620	.....	.....	On reduced area.
22,200	84,090	.....	.....	At time of fracture.
0	0	1.30	.....	= 26.0 per cent. total elongation.

Fractured 1″.5 from neck. Appearance, fibrous.

Local contraction, 1″ each side of fracture.

Diameter at fracture, ″.58. Area, .264 square inch. Contraction, 47.2 per cent.

Elongation of inch sections, ″.27, ″.46*, ″.20, ″.20, ″.17.

No. 1856.

Wrought iron, B.

Diameter, ".798.
Sectional area, .50 square inch.
Expansion, ".0211 in 6 inches.
Estimated temperature, 592° Fahr.
Gauged length, 5".

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
6,000	12,000	.0013	.....	
7,000	14,000	.0024	.....	Elastic limit.
8,000	16,000	.0047	.....	
9,000	18,000	.0085	.....	
10,000	20,000	.0145	.....	
11,000	22,000	.0218	.....	
12,000	24,000	.0303	.....	
13,000	26,000	.0413	.....	
14,000	28,000	.0523	.....	
15,000	30,000	.0649	.....	
16,000	32,000	.0783	.....	
17,000	34,000	.0946	.....	
18,000	36,000	.1087	.....	
19,000	38,000	.1261	.....	
20,000	40,000	.1439	.....	
21,000	42,000	.1656	.....	
22,000	44,000	.1888	.....	
23,000	46,000	.2168	.....	
24,000	48,000	.2476	.....	
25,000	50,000	.29	.....	
26,000	52,000	.335	.....	
27,000	54,000	.39	.....	
27,500	55,000	.42	.....	
28,000	56,000	.49	.....	
28,500	57,000	.55	.....	
29,000	58,000	.67	.....	
29,260	58,520	.80	.....	Tensile strength.
25,300	83,770	.....	.....	At time of fracture.
0	0	1.17	.....	= 23.4 per cent.

Fractured 1".75 from neck. Appearance, fibrous; oblique 47°; dark, bronze color. Surface of stem, blue black.

Local contraction, 1" each side of fracture.

Diameter at fracture, ".62. Area, .302 square inch. Contraction, 39.6 per cent.

Elongation of inch sections, ".20, ".44*, ".20, ".18, ".15.

No. 1908.

Wrought iron, B.

Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0238 in 6 inches.
Estimated temperature, 659° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
2,000	4,000	.0008	.....	
3,000	6,000	.0013	.....	
4,000	8,000	.0019	.....	
5,000	10,000	.0019	.....	
.....	.....	.0020	.....	After 1 minute.
6,000	12,000	.0030	.....	
.....	.....	.0030	.....	Do.
7,000	14,000	.0042	.....	Elastic limit.
.....	.....	.0043	.....	After 1 minute.
8,000	16,000	.0068	.....	
.....	.....	.0075	.....	Do.
9,000	18,000	.0119	.....	
.....	.....	.0127	.....	Do.
10,000	20,000	.0185	.....	
.....	.....	.0193	.....	Do.
11,000	22,000	.0272	.....	
.....	.....	.0284	.....	Do.
12,000	24,000	.0377	.....	
.....	.....	.0394	.....	Do.
13,000	26,000	.0499	.....	
.....	.....	.0523	.....	Do.
14,000	28,000	.0639	.....	
.....	.....	.0667	.....	Do.
15,000	30,000	.0772	.....	
.....	.....	.0809	.....	Do.
16,000	32,000	.0926	.....	
.....	.....	.0972	.....	Do.
17,000	34,000	.1097	.....	
.....	.....	.1161	.....	Do.
18,000	36,000	.1275	.....	
.....	.....	.1352	.....	Do.
19,000	38,000	.1501	.....	
.....	.....	.1581	.....	Do.
20,000	40,000	.1757	.....	
.....	.....	.1847	.....	Do.
21,000	42,000	.1984	.....	
.....	.....	.2159	.....	Do.
22,000	44,000	.2346	.....	
.....	.....	.2506	.....	Do.
Hot test discontinued.				
0	0	.26	.....	=5.2 per cent.

Elongation of inch sections, ″.05, ″.06, ″.05, ″.05, ″.05.
Minimum diameter, ″.779. Area, .477 square inch. Contraction, 4.6 per cent.
Surface of stem, dark blue, shading into brown hue.
Rested 65 hours; test then completed at temperature of 70° Fahr.
Gauged length, 5″.26.
Mean sectional area, .475 square inch.

No. 1908—Continued.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	.....	0.	0.	Initial load.
5,000	.....	.0014	.....	
10,000	.....	.0033	.....	E = 29,550,000 pounds between 5,000 and 25,000 pounds.
15,000	.....	.0051	0.	
18,000	.....	.0064	.....	
20,000	.....	.0071	.....	
21,000	.....	.0074	.....	
22,000	.....	.0077	.....	
23,000	.....	.0081	.....	
24,000	.....	.0085	.....	
25,000	.....	.0089	.....	
25,880	.....	.....	.....	Elastic limit.
	51,760	.....	.....	On original area.
	54,200	.....	.....	On reduced area.
Load fell.				
24,700	.....	.0173	.....	
	.....	.0216	.....	
25,000	.....	.0868	.....	
26,000	.....	.1420	.....	
27,000	.....	.21	.....	
27,500	.....	.25	.....	
	.....	.40	.....	Tensile strength.
27,890	55,780	.....	.....	On original area.
	58,470	.....	.....	On reduced area.
23,300	88,260	.....	.....	At time of fracture.
0	0	.98	.....	= 19.6 per cent. total elongation.

Fractured 1″ from neck. Appearance, fibrous; layers of metal differ in color from light to dark.

Local contraction, 1″ each side of fracture.

Diameter at fracture, ″.58. Area, .264 square inch. Contraction, 47.2 per cent.

Elongation of inch sections, ″.43*, ″.18, ″.12, ″.12, ″.13.

No. 1905.

Wrought iron, B.

Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0239 in 6 inches.
Estimated temperature, 662° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
2,000	4,000	.0007	.....	
3,000	6,000	.0017	.....	
4,000	8,000	.0018	.....	
5,000	10,000	.0022	.....	
.....	.....	.0025	.....	After 1 minute.
6,000	12,000	.0034	.....	
7,000	14,000	.0053	.....	Elastic limit (not well defined).
8,000	16,000	.0084	.....	
.....	.....	.0092	.....	After 1 minute.
9,000	18,000	.0140	.....	
10,000	20,000	.0214	.....	
11,000	22,000	.0302	.....	
.....	.....	.0317	.....	Do.
12,000	24,000	.0421	.....	
.....	.....	.0441	.....	Do.
13,000	26,000	.0557	.....	
14,000	28,000	.0687	.....	
15,000	30,000	.0823	.....	
16,000	32,000	.0972	.....	
17,000	34,000	.1140	.....	
18,000	36,000	.1346	.....	
.....	.....	.1424	.....	Do.
.....	.....	.1448	.....	After 2 minutes.
.....	.....	.1464	.....	After 3 minutes.
.....	.....	.1476	.....	After 4 minutes.
.....	.....	.1484	.....	After 5 minutes.
.....	.....	.1488	.....	After 6 minutes.
.....	.....	.1496	.....	After 7 minutes.
.....	.....	.1501	.....	After 8 minutes.
.....	.....	.1506	.....	After 9 minutes.
.....	.....	.1512	.....	After 10 minutes.
.....	.....	.1516	.....	After 11 minutes.
.....	.....	.1521	.....	After 12 minutes.
.....	.....	.1526	.....	After 13 minutes.
.....	.....	.1528	.....	After 14 minutes.
.....	.....	.1533	.....	After 15 minutes.
Hot test discontinued.				
0	0	.15	.....	= 3.0 per cent.

Elongation of inch sections, ″.03, ″.03, ″.03, ″.03, ″.03.
Minimum diameter, ″.786. Area, .485 square inch. Contraction, 3.0 per cent.
Surface of stem, blue-black and bronze color.
Tested 50 hours; test then completed at temperature of 70° Fahr.
Gauged length, 5″.15.
Mean sectional area, .485 square inch.

No. 1905—Continued.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	.....	0.	0.	Initial load.
5,000	.....	.0015	.....	
10,000	.....	.0033	.....	E=28,930,000 pounds between 5,000 and 20,0 pounds.
15,000	.....	.0051	0.	
18,000	.....	.0062	.....	
20,000	.....	.0070	.....	
21,000	.....	.0072	.....	
22,000	.....	.0077	.....	
22,700	.....	.....	.....	Elastic limit.
	45,400	.....	.....	On original area.
	46,800	.....	.....	On reduced area.
Load fell.				
21,300	.....	.0340	.....	
22,000	.....	.0990	.....	
23,000	.....	.1370	.....	
24,000	.....	.19	.....	
25,000	.....	.27	.....	
25,500	.....	.36	.....	
26,000	.....	.47	.....	
26,310	.....	.72	.....	Tensile strength.
	52,620	.....	.....	On original area.
	54,250	.....	.....	On reduced area.
22,100	86,670	.....	.....	At time of fracture.
0	0	1.30	.....	=26.0 per cent. total elongation.

Fractured 2″ from neck. Appearance, fibrous.

Local contraction, 1″ each side of fracture.

Diameter at fracture, ″.57. Area, .255 square inch. Contracti 49.0 per cent.

Elongation of inch sections, ″.15, ″.22, ″.23, ″.52*, ″.18.

No. 1854.

Wrought iron, B.

Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0248 in 6 inches.
Estimated temperature, 684° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
7,000	14,000	.0012	.....	Elastic limit.
8,000	16,000	.0038	.....	
9,000	18,000	.0065	.....	
10,000	20,000	.0153	.....	
11,000	22,000	.0210	.....	
12,000	24,000	.0310	.....	
13,000	26,000	.0425	.....	
14,000	28,000	.0538	.....	
15,000	30,000	.0669	.....	
16,000	32,000	.0810	.....	
17,000	34,000	.0943	.....	
18,000	36,000	.1124	.....	
19,000	38,000	.1308	.....	
20,000	40,000	.1528	.....	
21,000	42,000	.1743	.....	
22,000	44,000	.2010	.....	
23,000	46,000	.2335	.....	
24,000	48,000	.2728	.....	
25,000	50,000	.33	.....	
26,000	52,000	.40	.....	
27,500	55,000	.565	.....	
28,000	56,000	.70	.....	
28,070	56,140	.81	.....	Tensile strength.
24,100	77,240	.....	.....	At time of fracture.
0	0	1.24	.....	= 24.8 per cent.

Fractured 2″.50 from neck. Appearance, fibrous; oblique 48°; deep-blue color. Surface of stem, blue black.

Local contraction, ″.6 and ″.8 from fracture.

Diameter at fracture, ″.63. Area, .312 square inch. Contraction, 37.6 per cent.

Elongation of inch sections, ″.19, ″.40*, ″.36, ″.17, ″.12.

No. 1901.

Wrought iron, B.

Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0265 in 6 inches.
Estimated temperature, 726° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
2,000	4,000	.0010	.....	
3,000	6,000	.0019	.....	
4,000	8,000	.0022	.....	
5,000	10,000	.0029	.....	
6,000	12,000	.0042	.....	
7,000	14,000	.0055	.....	Elastic limit.
8,000	16,000	.0093	.....	
9,000	18,000	.0147	.....	
10,000	20,000	.0223	.....	
11,000	22,000	.0324	.....	
12,000	24,000	.0447	.....	
13,000	26,000	.0584	.....	
14,000	28,000	.0749	.....	
15,000	30,000	.0928	.....	
16,000	32,000	.1142	.....	
17,000	34,000	.1250	.....	
18,000	36,000	.1462	.....	
19,000	38,000	.1772	.....	
20,000	40,000	.2072	.....	
21,000	42,000	.2422	.....	
22,000	44,000	.2717	.....	
23,000	46,000	.355	.....	
24,000	48,000	.46	.....	
24,280	48,560	.58	.....	Tensile strength.
24,000	.....	.....	.....	Hot test discontinued.
0	0	.64	.....	= 12.8 per cent.

Elongation of inch sections, ″.24, ″.14, ″.10, ″.09, ″.07.
Minimum diameter ″.70. Area, .385 square inch. Contraction, 23.0 per cent.
Surface of stem, blue black with purple cast.
Test completed after 5 days' rest, at temperature of 70° Fahr.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
27,500	.....	.....	.....	Elastic limit.
	55,000	.....	.....	On original area.
	71,430	.....	.....	On reduced area.
28,100	.....	.....	.....	Tensile strength.
	56,200	.....	.....	On original area.
	72,990	.....	.....	On reduced area.
0	0	.97	.....	= 19.4 per cent. total elongation.

Fractured ″.5 from neck at place of minimum section after the test was discontinued. Appearance, fibrous.
Local contraction extends to the neck, and 1″ from fracture.
Diameter at fracture, ″.59. Area, .273 square inch. Contract 45.4 per cent.
Elongation of inch sections, ″.46*, ″.16, ″.13, ″.12, ″.10.

No. 1855.

Wrought iron, B.

Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0272 in 6 inches.
Estimated temperature, 743° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
5,000	10,000	.0018	.....	
6,000	12,000	.0031	.....	
7,000	14,000	.0047	.....	Elastic limit.
8,000	16,000	.0076	.....	
9,000	18,000	.0131	.....	
10,000	20,000	.0216	.....	
11,000	22,000	.0324	.....	
12,000	24,000	.0448	.....	
13,000	26,000	.0588	.....	
14,000	28,000	.0744	.....	
15,000	30,000	.0904	.....	
16,000	32,000	.1102	.....	
17,000	34,000	.1305	.....	
18,000	36,000	.1556	.....	
19,000	38,000	.1920	.....	
20,000	40,000	.2343	.....	
21,000	42,000	.2955	.....	
22,000	44,000	.405	.....	
22,350	44,700	.50 .58	.....	Tensile strength.
20,500	.....	.....	.....	Test discontinued.
	Bar cooled to 70° Fahr.			
0	0	1.12	.....	= 22.4 per cent.

Elongation of inch sections, ″.11, ″.20, ″.37, ″.29, ″.15.
Minimum diameter, ″.68. Area, .363 square inch. Contraction, 27.4 per cent.
After a rest of 1 hour bar again placed in the machine and ruptured.
Present minimum sectional area, .363 square inch.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
nds.	*Pounds.*	*Inches.*	*Inch.*	
000	.....	.....	.....	Rapid stretching resumed.
	.....	.....	.....	Tensile strength.
380	48,760	.....	.....	On original area.
	67,160	.....	.....	On reduced area.
000	88,240	.....	.....	At time of fracture.
0	0	1.45	.....	= 29.0 per cent.

actured 2″.75 from neck. Appearance, fibrous.
ameter at fracture, ″.55. Area, .238 square inch. Contraction, per cent.
ngation of inch sections, ″.11, ″.23, ″.60*, ″.36, ″.15.

No. 1853.

Wrought iron B.,

Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0325 in 6 inches.
Estimated temperature, 804° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
6,000	12,000	.0014	.....	Elastic limit.
7,000	14,000	.0027	.....	
8,000	16,000	.0048	.....	
9,000	18,000	.0102	.....	
10,000	20,000	.0186	.....	
11,000	22,000	.0284	.....	
12,000	24,000	.0442	.....	
13,000	26,000	.0594	.....	
14,000	28,000	.0774	.....	
15,000	30,000	.0985	.....	
16,000	32,000	.1252	.....	
17,000	34,000	.1602	.....	
18,000	36,000	.2093	.....	
19,000	38,000	.28	.....	
20,000	40,000	.42	.....	
20,180	40,360	.545 .725	.....	Tensile strength.
12,500	56,560	.....	.....	At time of fracture.
0	0	1.54	.....	= 30.8 per cent.

Fractured 2″.75 from neck. Appearance, fibrous; blue-black color. Surface of stem, bronze black.

Local contraction, 1″.3 each side of fracture.

Diameter at fracture, ″.53. Area, .221 square inch. Contraction, 55.8 per cent.

Elongation of inch sections, ″.10, ″.19, ″.67*, ″.42, ″.16.

No. 1907.

Wrought iron, B.

Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0341 in 6 inches.
Estimated temperature, 915° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
2,000	4,000	.0006	.....	
		.0007	.....	After 1 minute.
3,000	6,000	.0013	.....	
		.0015	.....	Do.
4,000	8,000	.0019	.....	
		.0020	.....	Do.
5,000	10,000	.0024	.....	
		.0026	.....	Do.
6,000	12,000	.0036	.....	Elastic limit.
		.0039	.....	After 1 minute.
7,000	14,000	.0053	.....	
		.0062	.....	Do.
8,000	16,000	.0085	.....	
		.0106	.....	Do.
9,000	18,000	.0157	.....	
		.0188	.....	Do.
10,000	20,000	.0264	.....	
		.0324	.....	Do.
		.0369	.....	After 2 minutes.
		.0400	.....	After 3 minutes.
		.0424	.....	After 4 minutes.
		.0452	.....	After 5 minutes.
		.0474	.....	After 6 minutes.
		.0496	.....	After 7 minutes.
		.0516	.....	After 8 minutes.
		.0532	.....	After 9 minutes.
		.0549	.....	After 10 minutes.
		.0564	.....	After 11 minutes.
		.0581	.....	After 12 minutes.
		.0595	.....	After 13 minutes.
		.0609	.....	After 14 minutes.
		.0624	.....	After 15 minutes.
		.0635	.....	After 16 minutes.
		.0650	.....	After 17 minutes.
		.0661	.....	After 18 minutes.
		.0674	.....	After 19 minutes.
		.0685	.....	After 20 minutes.
		.0698	.....	After 21 minutes.
		.0708	.....	After 22 minutes.
		.0720	.....	After 23 minutes.
		.0732	.....	After 24 minutes.
		.0742	.....	After 25 minutes.
11,000	22,000	.0749	.....	
12,000	24,000	.0791	.....	
13,000	26,000	.0937	.....	
14,000	28,000	.1152	.....	
15,000	30,000	.1443	.....	
16,000	32,000	.1892	.....	
17,000	34,000	.245	.....	
18,000	36,000	.34	.....	
19,000	38,000	.515	.....	
9,100	38,200	.665	.....	Tensile strength.
1,700	55,190	.....	.....	At time of fracture.
0	0	1.49	.....	= 29.8 per cent.

actured at middle of stem. Appearance, fibrous. Surface of fract-
nd stem, dark blue.
cal contraction, 1″.5 each side of fracture.
ameter at fracture, ″.52. Area, .212 square inch. Contraction,
per cent.
gation of inch sections, ″.14, ″.29, ″.75*, ″.23, ″.08.

No. 1904.

Wrought iron, B.

Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0361 in 6 inches.
Estimated temperature, 964° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
5,000	10,000	.0014	.....	
6,000	12,000	.0026	.....	
7,000	14,000	.0034	.....	Elastic limit.
8,000	16,000	.0073	.....	
9,000	18,000	.0135	.....	
10,000	20,000	.0234	.....	
11,000	22,000	.0342	.....	
12,000	24,000	.0495	.....	
13,000	26,000	.0662	.....	
14,000	28,000	.0907	.....	
15,000	30,000	.1162	.....	
16,000	32,000	.1545	.....	
17,000	34,000	.2213	.....	
18,000	36,000	.3770	.....	
18,250	36,500	.54	.....	Tensile strength
13,400	60,630	.....	.....	At time of fracture.
0	0	1.34	.....	=26.8 per cent.

Fractured 2″.75 from neck. Appearance, fibrous. Surface of fracture and stem, blue black.

Local contraction, 1″.75 each side of fracture.

Diameter at fracture, ″.53. Area, .221 square inch. Contraction, 55.8 per cent.

Elongation of inch sections, ″.10, ″.42, ″.61*, ″.15, ″.06.

No. 1857.

Wrought iron, B.

Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0408 in 6 inches.
Estimated temperature, 1079° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1, 000	2, 000	0.	0.	Initial load.
2, 000	4, 000	—. 0003	.....	
3, 000	6, 000	. 0001	.....	
4, 000	8, 000	. 0013	.....	
4, 500	9, 000	. 0024	.....	
5, 000	10, 000	. 0028	.....	
5. 500	11. 000	. 0040	.....	
6, 000	12, 000	. 0053	.....	Elastic limit.
6. 500	13. 000	. 0073	.....	
7. 000	14, 000	. 0098	.....	
8, 000	16, 000	. 0246	.....	
9, 000	18, 000	. 0516	.....	
10, 000	20, 000	. 1247	.....	
11, 000	22, 000	. 1875	.....	
11, 780	23, 560	. 345	.....	Tensile strength.
0	0	. 98	.....	=18.6 per cent.

Fractured ″.70 from neck. Appearance, fibrous. Surface of fracture and stem, blue black color.

Diameter at fracture, ″.47. Area, .173 square inch. Contraction, 65.4 per cent.

Elongation of inch sections, ″.65*, ″.12, ″.06, ″.05, ″.05.

No. 1902.

Wrought iron, B.

Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0457 in 6 inches.
Estimated temperature, 1201° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
2,000	4,000	.0012	.....	
3,000	6,000	.0024	.....	
4,000	8,000	.0041	.....	
5,000	10,000	.0094	.....	
6,000	12,000	.0257	.....	
7,000	14,000	.0685	.....	
8,000	16,000	.1703	.....	
8,390	16,780	.4603	.....	Tensile strength.
0	0	2.20	.....	= 44.0 per cent.

Fractured 3″.25 from neck. Appearance, fibrous. Surface of f
ure and stem blue-black color. Surface cracks in stem near the p
of rupture.

Local contraction, 3″ each side of fracture.

Diameter at fracture, ″.42. Area, .139 square inch. Contrac
72.2 per cent.

Elongation of inch sections, ″.12, ″.42, 1″.20*, ″.33, ″.13.

No. 1903.

Wrought iron, B.

Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0551 in 6 inches.
Estimated temperature, 1434° Fahr.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
		.0005		No apparent elastic limit.
1,500	3,000	.0013		
		.0026		After 1 minute.
2,000	4,000	.0067		
		.0098		Do.
2,500	5,000	.0185		
		.0365		Do.
3,000	6,000	.0515		Tensile strength.
		.0980		After 1 minute.
		.1420		After 2 minutes.
		.1815		After 3 minutes.
		.2250		After 4 minutes.
		.2680		After 5 minutes.
		.2995		After 6 minutes.
		.3390		After 7 minutes.
		.3690		After 8 minutes.
		.41		After 9 minutes.
		.45		After 10 minutes.
		.49		After 11 minutes.
		.53		After 12 minutes.
		.57		After 13 minutes.
		.61		After 14 minutes.
		.66		After 15 minutes.
		.71		After 16 minutes.
		.76		After 17 minutes.
		.82		After 18 minutes.
		.88		After 19 minutes.
		.95		After 20 minutes.
		1.06		After 21 minutes.
		1.16		After 22 minutes.
		1.29		After 23 minutes.
		1.54		After 24 minutes.
				After 24½ minutes; bar fractured.
0	0	2.00		= 40.0 per cent.

Fractured 3″.25 from neck. Appearance, fibrous, spongy. Surface of fracture and stem, blue black.

Local contraction, 2″ each side of fracture.

Diameter at fracture, ″.42. Area, .139 square inch. Contraction, 72.2 per cent.

Elongation of inch sections, ″.10, ″.28, 1″.12*, ″.29, ″.21.

No. 1858.

Wrought iron, B.

Diameter, ″.798.
Sectional area, .50 square inch.
Expansion, ″.0585 in 6 inches.
Estimated temperature, 1518° Fahr.
Gauged length, 5″.

Applied loads.		In ganged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	2,000	0.	0.	Initial load.
1,500	3,000	.0014	.....	
2,000	4,000	.0050	.....	No elastic limit apparent.
2,500	5,000	.0155	.....	
3,000	6,000	.0550	.....	
3,200	6,400	.1119	.....	
3,300	6,600	.1528	.....	
3,400	6,800	.2012	.....	
3,500	7,000	.2511	.....	
3,600	7,200	.3140	.....	
3,700	7,400	.45 .68	.....	Tensile strength.
0	0	1.84	.....	=36.8 per cent.

Fractured 3″.25 from neck. Appearance, fibrous. Surfaces of fracture and stem, blue-black color. Reddish-brown powder on surface of stem. Raised a scale.

Diameter at fracture, ″.37. Area, .108 square inch. Contraction, 78.4 per cent.

Elongation of inch sections, ″.05, ″.16, ″.08*, ″.38, ″.15.

No. 1832.

Cast-iron.

Temperature, 70° Fahr.
Tensile strength, 17,190 pounds = 34,380 pounds per square inch.
Fractured at the neck. Appearance, uniform granular.

No. 1833.

Cast-iron.

Temperature, 70° Fahr.
Tensile strength, 13,280 pounds = 26,560 pounds per square inch.
Fractured at the middle of the stem at a blow-hole ″.15 in diamete
The blow hole was in sight before testing. Appearance, granular

No. 1834.

Cast-iron.

Temperature, 70° Fahr.
Tensile strength, 14,590 pounds=29,180 pounds per square inch.
Fractured at neck. Appearance, granular. Fractured at blow-hole ".15 diameter; invisible before fracture.

No. 1835.

Cast-iron.

Temperature, 70° Fahr.
Tensile strength, 14,030 pounds=28,060 pounds per square inch.
Fractured at neck. Appearance, uniform granular.

No. 1828.

Cast-iron.

Expansion, ".0063 in 6 inches.
Estimated temperature, 247° Fahr.
Tensile strength, 13,060 pounds=26,120 pounds per square inch.
Fractured at neck. Appearance, uniform granular; 5 per cent. of fractured surface faint straw color.

No. 1848.

Cast-iron.

Expansion, ".0073 in 6 inches.
Estimated temperature, 275° Fahr.
Tensile strength, 16,070 pounds=32,140 pounds per square inch.
Fractured 1".10 from neck. Appearance, uniform granular.

No. 1836.

Cast-iron.

Expansion, ".0074 in 6 inches.
Estimated temperature, 278° Fahr.
Tensile strength, 16,470 pounds=32,940 pounds per square inch.
Fractured 1¼" from neck. Appearance, uniform granular. No change in color.
Surface of stem, straw colored, mottled.

No. 1982.

Cast-iron.

Expansion, ".0076 in 6 inches.
Estimated temperature, 283° Fahr.
Tensile strength, 14,980 pounds=29,960 pounds per square inch.
Appearance of fracture, granular; spot ".10 diameter near the circumference having a smooth surface. No change in color.
Surface of stem, faint straw color.

No. 1847.

Cast-iron.

Expansion, ″.0100 in 6 inches.
Estimated temperature, 351° Fahr.
Tensile strength, 16,460 pounds=32,920 pounds per square inch.
Fractured ″.6 from neck. Appearance, uniform granular. No cha
in color.
Surface of stem, straw color.

No. 1829.

Cast-iron.

Expansion, ″.0145 in 6 inches.
Estimated temperature, 477° Fahr.
Tensile strength, 14,990 pounds=29,980 pounds per square inch.
Fractured ½″ from middle of stem. Appearance, uniform granul
gray and straw color. Surface of stem varies from straw color to y
lowish purple.

No. 1837.

Cast-iron.

Expansion, ″.0147 in 6 inches.
Estimated temperature, 483° Fahr.
Tensile strength, 15,490 pounds=30,980 pounds per square inch.
Fractured at the neck. Appearance, uniform granular. No cha
in color.
Surface of stem, straw colored with purple tint.

No. 1838.

Cast-iron.

Expansion, ″.0226 in 5″.96 inches.
Estimated temperature, 710° Fahr.
Tensile strength, 18,080 pounds=36,160 pounds per square inch.
Fractured 1″ from neck. Appearance, uniform granular; v
dark-purple color. Surface of stem, blue black, mottled.

No. 1830.

Cast-iron.

Expansion, ″.0230 in 6 inches.
Estimated temperature, 716° Fahr.
Tensile strength, 17,080 pounds=34,160 pounds per square inch.
Fractured at neck. Appearance, uniform granular; very da
purple color. Surface of stem, dark blue.

No. 1843.

Cast-iron.

Expansion, ".0276 in 6 inches.
Estimated temperature, 845° Fahr.
Tensile strength, 17,190 pounds=34,380 pounds per square inch.
Fractured 1".9 from neck. Appearance, uniform granular. Surfaces of stem and fracture, dark blue.

No. 1844.

Cast-iron.

Expansion, ".0293 in 6 inches.
Estimated temperature, 893° Fahr.
Tensile strength, 18,080 pounds=36,160 pounds per square inch.
Fractured 2" from neck. Appearance, uniform granular. Surfaces of stem and fracture, blue black.

No. 1831.

Cast-iron.

Expansion, ".0318 in 6 inches.
Estimated temperature, 963° Fahr.
Tensile strength, 16,760 pounds=33,520 pounds per square inch.
Fractured at middle of stem. Appearance, uniform granular. Surfaces of stem and fracture, blue-black color.

No. 1839.

Cast-iron.

Expansion, ".0326 in 6 inches.
Estimated temperature, 986° Fahr.
Tensile strength, 15,770 pounds=31,540 pounds per square inch.
Fractured ".5 from neck. Appearance, uniform granular.

No. 1845.

Cast-iron.

pansion, ".0366 in 6 inches.
timated temperature, 1098° Fahr.
nsile strength, 10,020 pounds=20,040 pounds per square inch.
actured 2" from neck. Appearance, uniform granular. Surfaces tracture and stem blue black. Surface of stem has brownish tint.

No. 1842.

Cast-iron.

Expansion, ".0390 in 6 inches.
Estimated temperature, 1166° Fahr.
Tensile strength, 11,480 pounds=22,960 pounds per square inch.
Fractured ".4 from neck. Appearance, uniform granular. Surfaces of fracture and stem, dark blue.

No. 1980.

Cast-iron.

Expansion, ".0422 in 6 inches.
Estimated temperature, 1255° Fahr.
Tensile strength, 11,220 pounds=22,440 pounds per square inch.
Appearance of fracture, uniform granular. Surface of fracture and stem, blue black.

No. 1840.

Cast-iron.

Expansion, ".0475 in 6 inches.
Estimated temperature, 1404° Fahr. Stem of specimen was dull red.
Tensile strength, 7,470 pounds=14,940 pounds per square inch.
Fractured at middle of stem, nearly separating in two places $\frac{1}{2}$" apart, opening fissures in surface of stem. Tore apart gradually. Appearance, uniform granular; black with tinge of blue. Surface of stem, blue.

No. 1841.

Cast-iron.

Expansion, ".0503 in 6 inches.
Estimated temperature, 1483° Fahr.
Tensile strength, 5,640 pounds=11,280 pounds per square inch.
Fractured ".4 from middle of stem, and nearly separating the metal ".2 from this place. Tore apart gradually, opening fissures in the surface of stem. Appearance, uniform granular; black tinged with blue. Surface of stem, blue.

No. 1846.

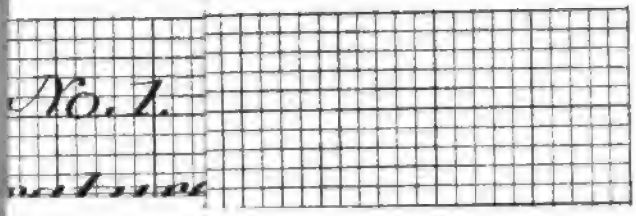
Cast-iron.

Expansion, ".0550 in 6 inches.
Estimated temperature, 1615° Fahr.
Tensile strength, 4,370 pounds=8,740 pounds per square inch.
Fractured 2".2 from neck. Appearance, uniform granular; dark blue color. Surface of stem, blue.

No. 1981.

Cast-iron.

Expansion, ".0575 in 6 inches.
Estimated temperature, 1685° Fahr.
Tensile strength, 4,910 pounds=9,820 pounds per square inch.
Appearance of fracture, uniform granular. Surface of fracture and stem, dark blue.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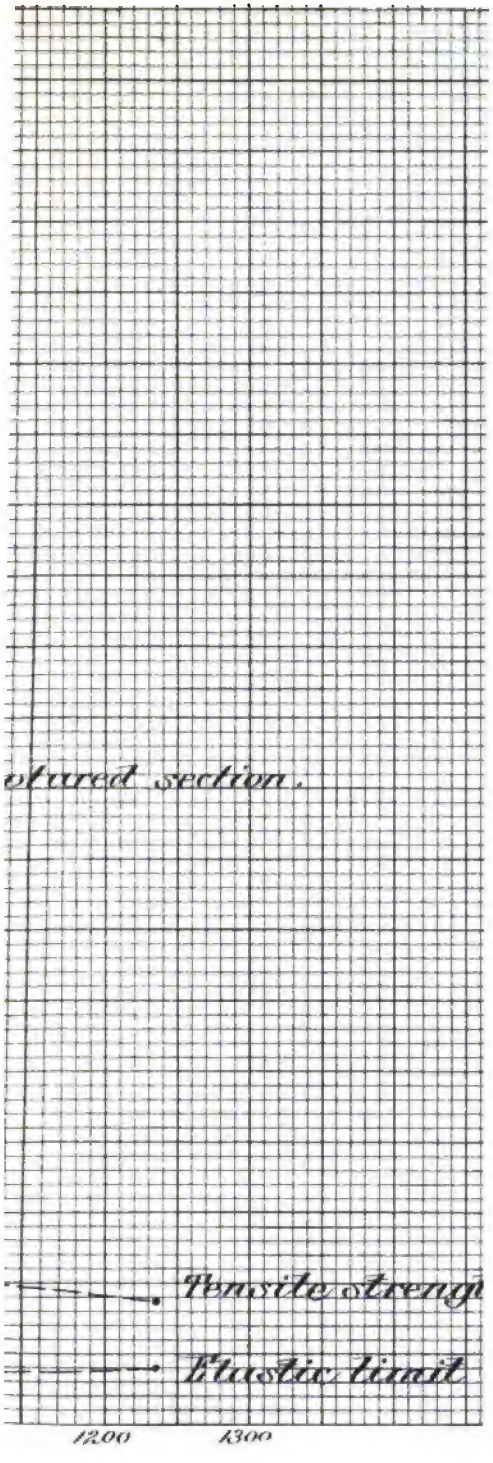
sured section.
Tensile strengt
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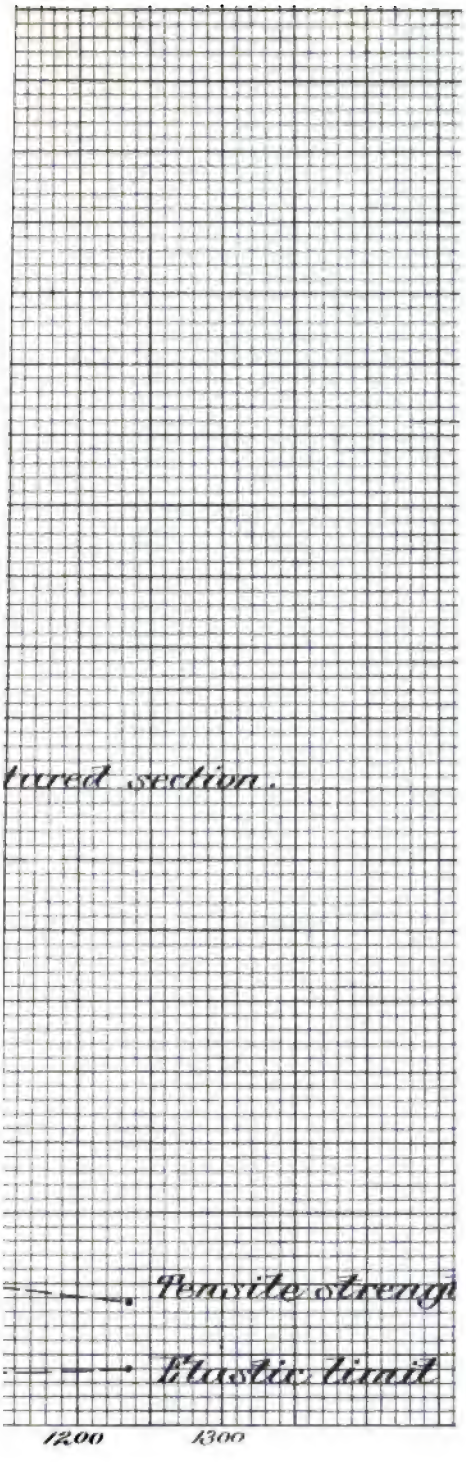
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Tensile strengt
Elastic limit
1200
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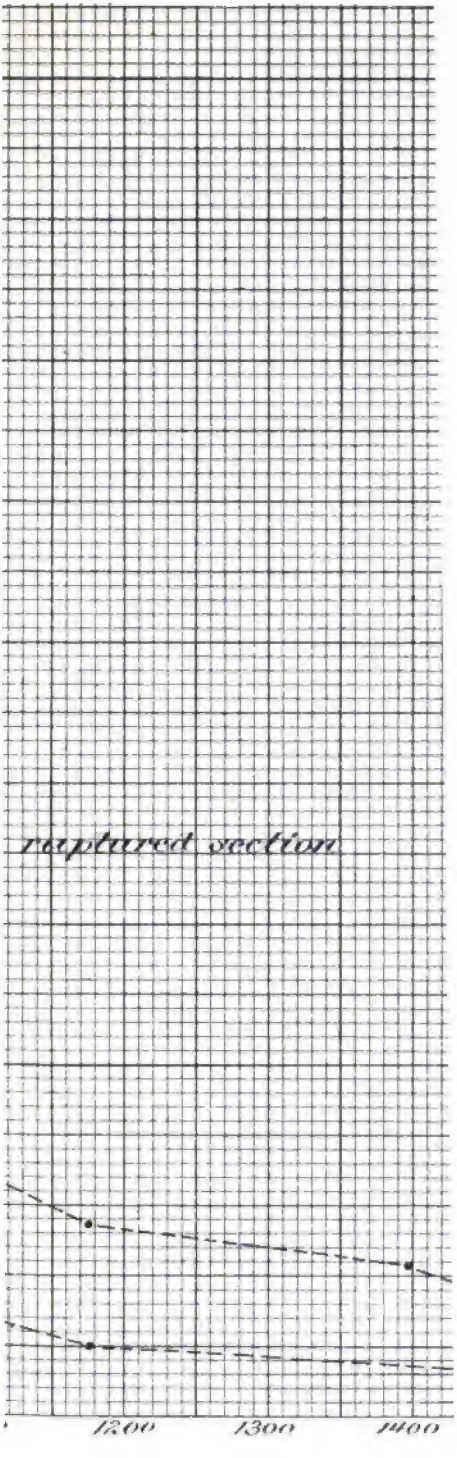
raptured section
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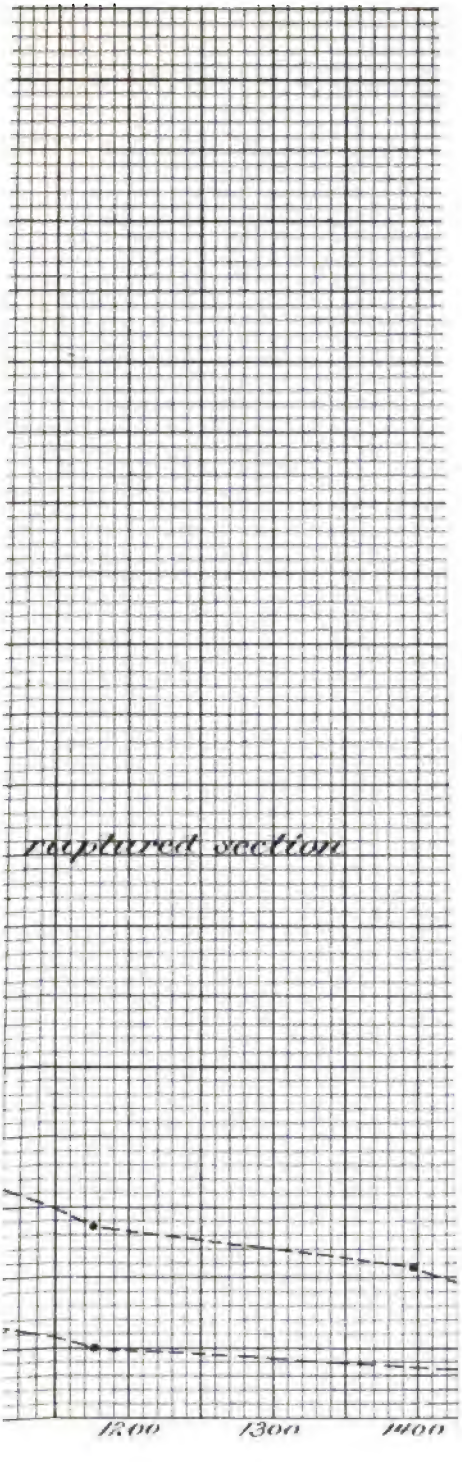
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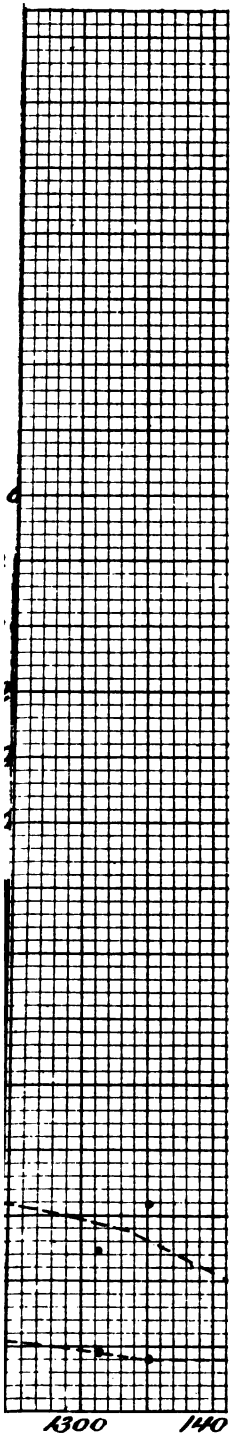
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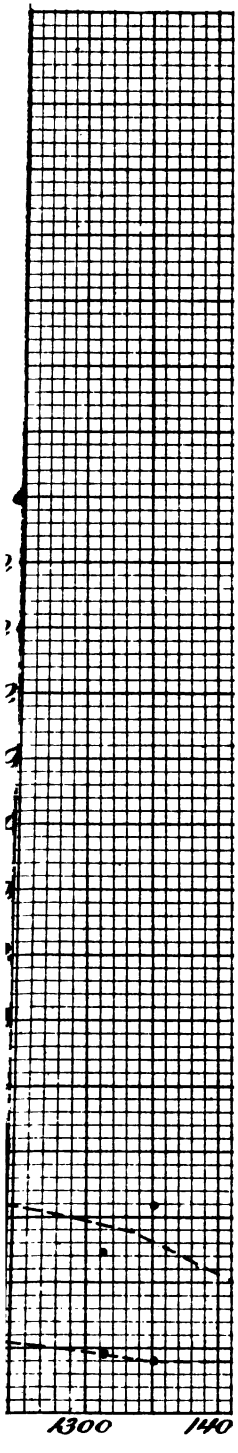
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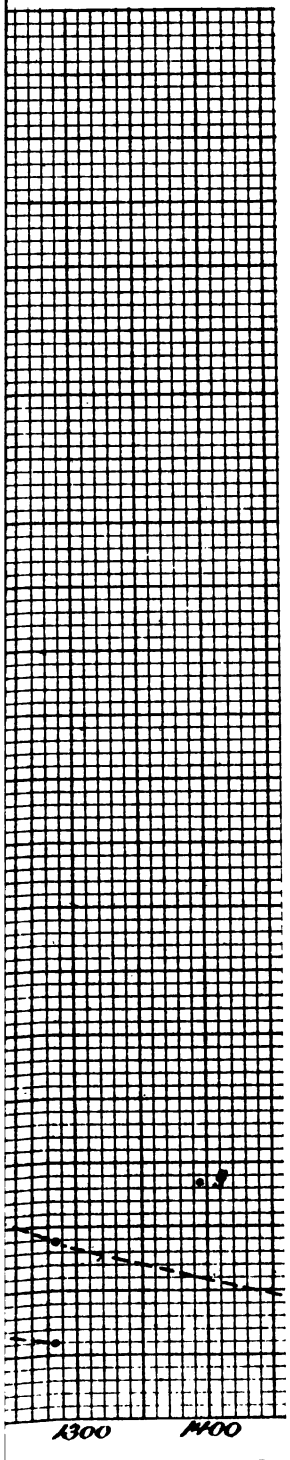

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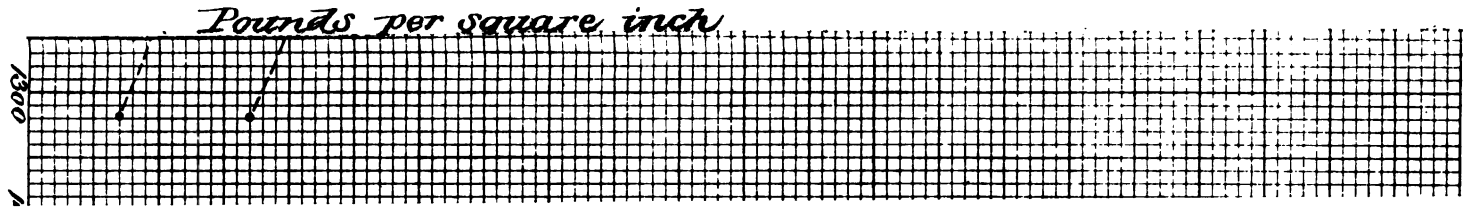
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Pounds per square inch
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Pounds per square inch
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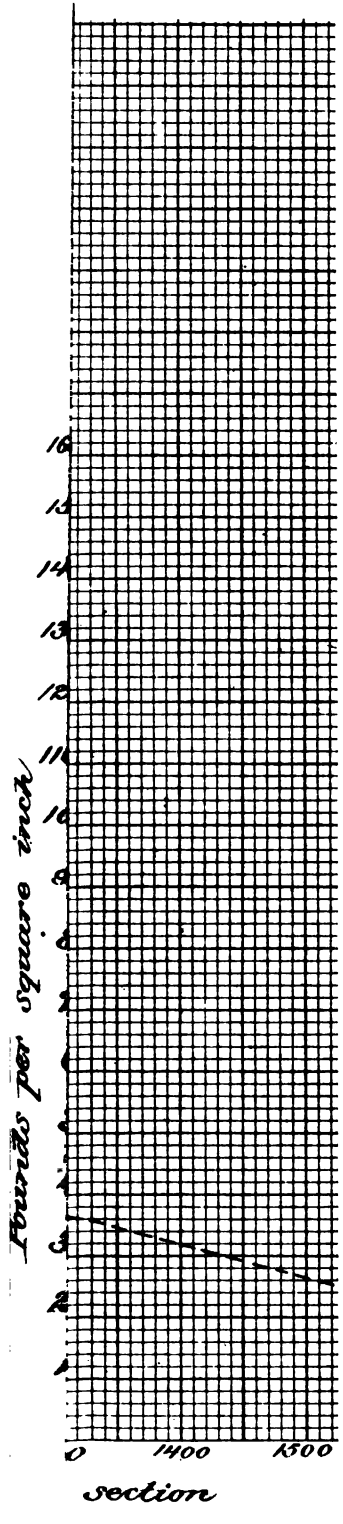
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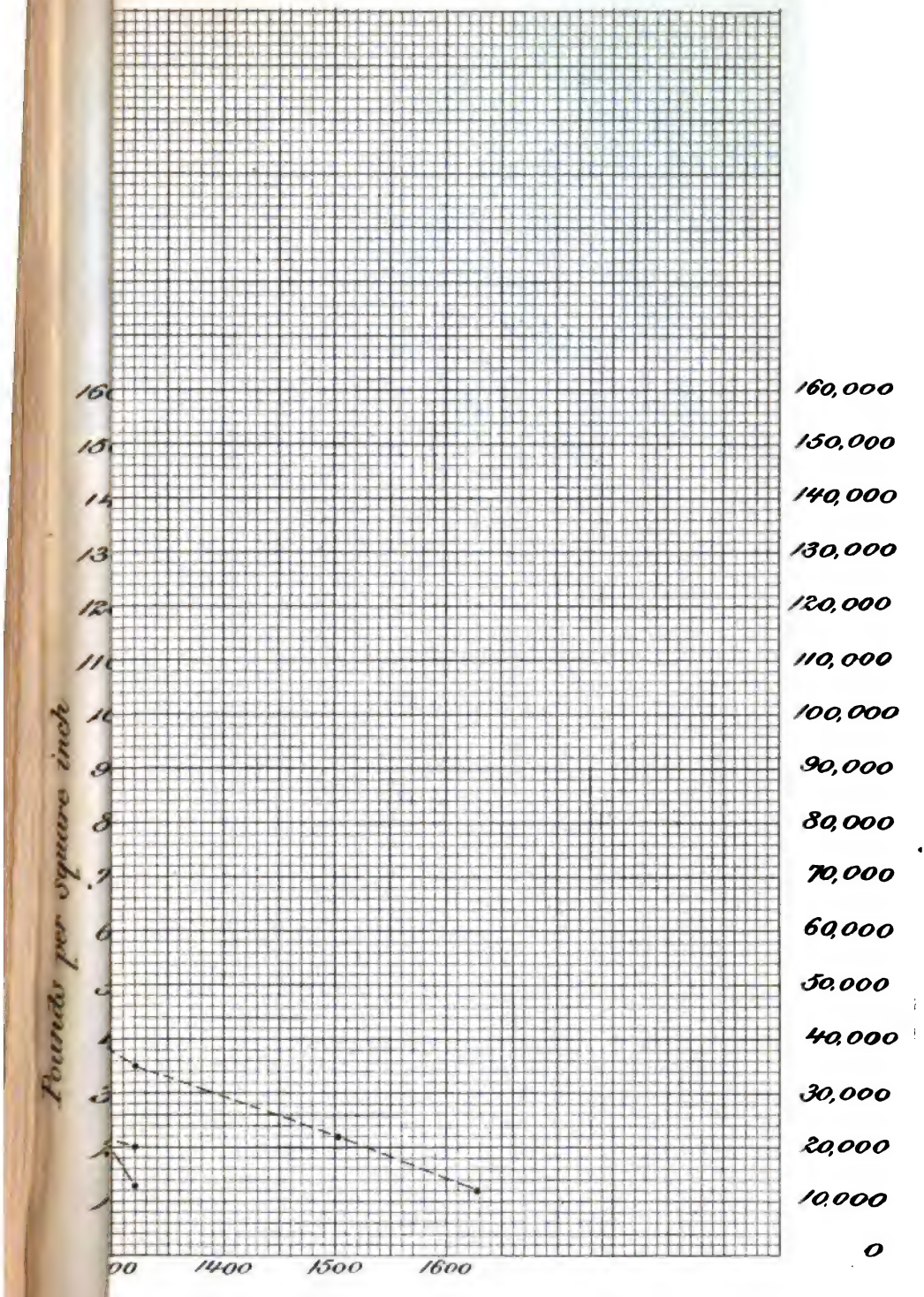
Pounds per square inch
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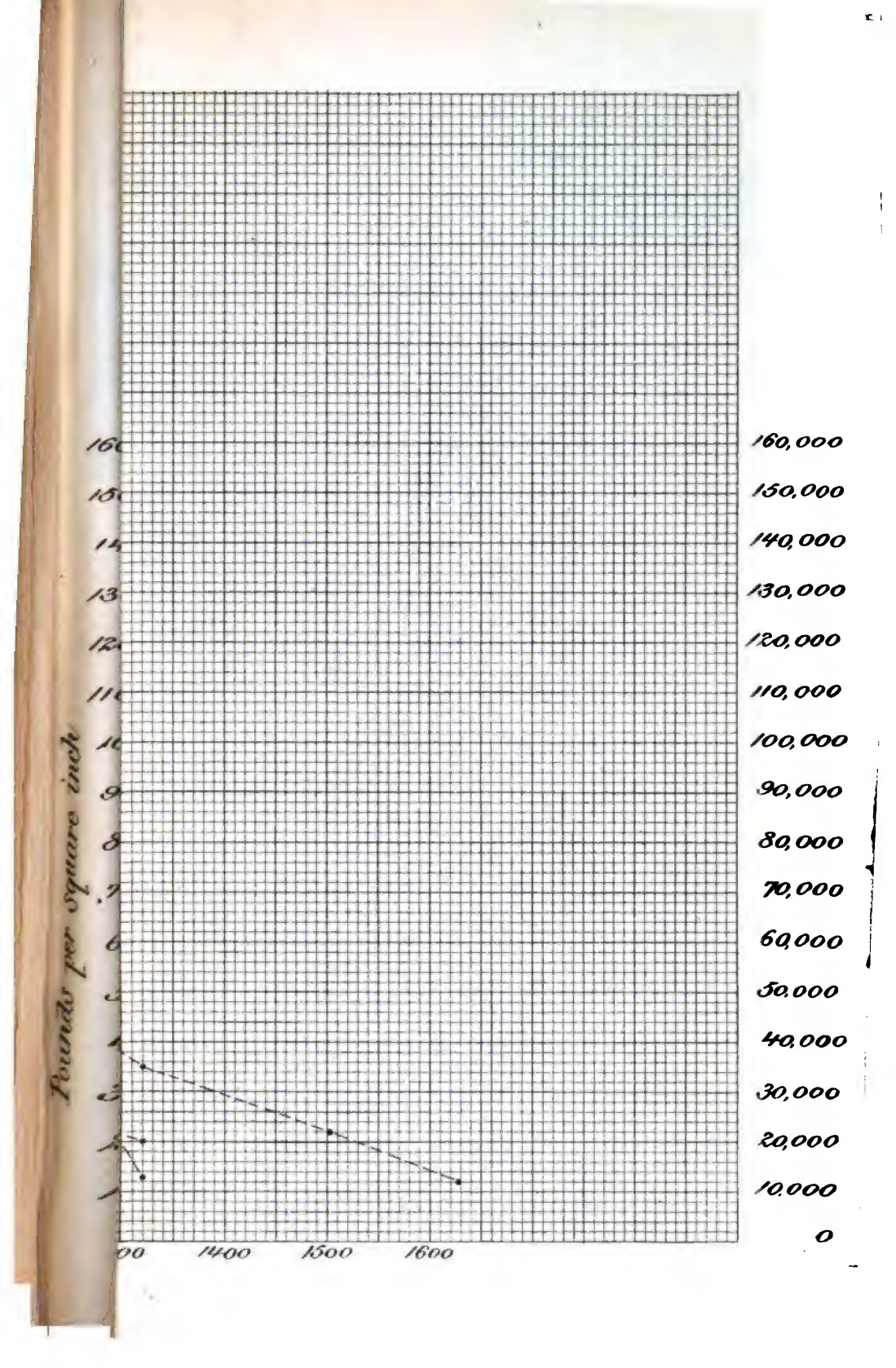
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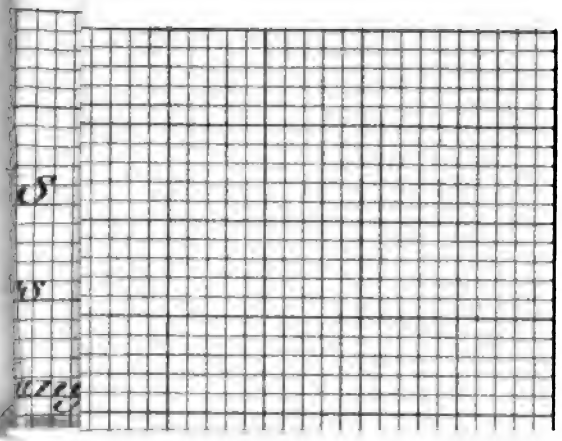

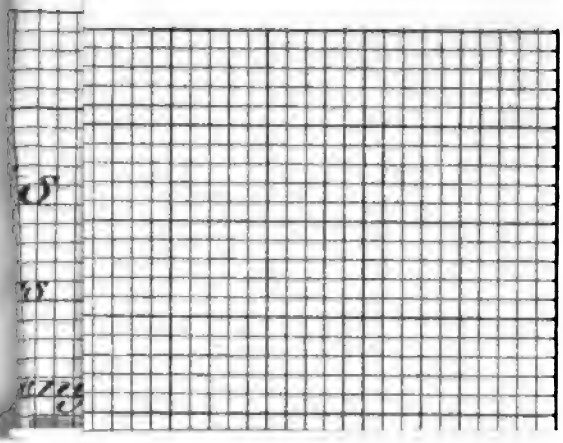

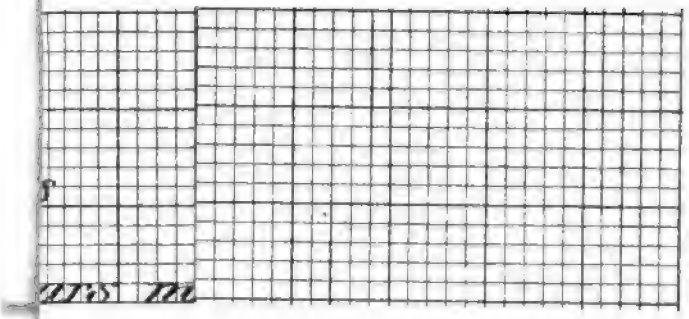

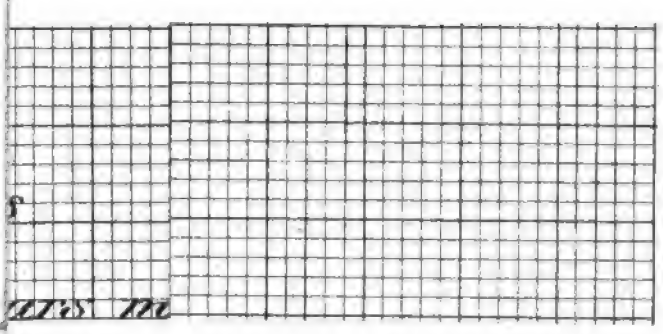

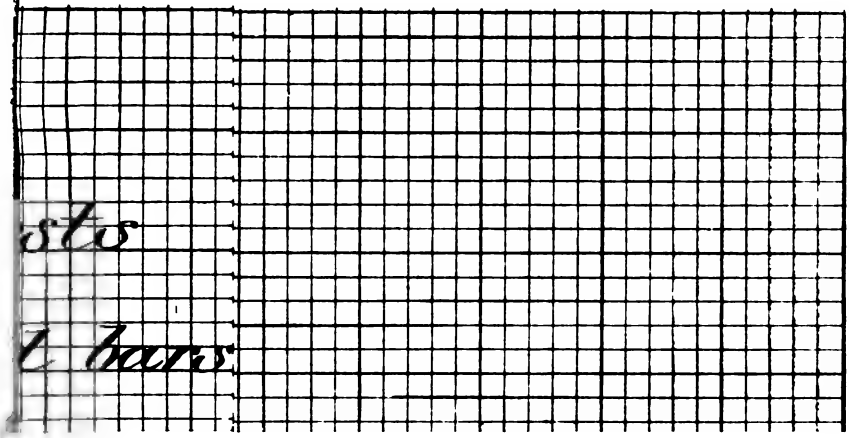
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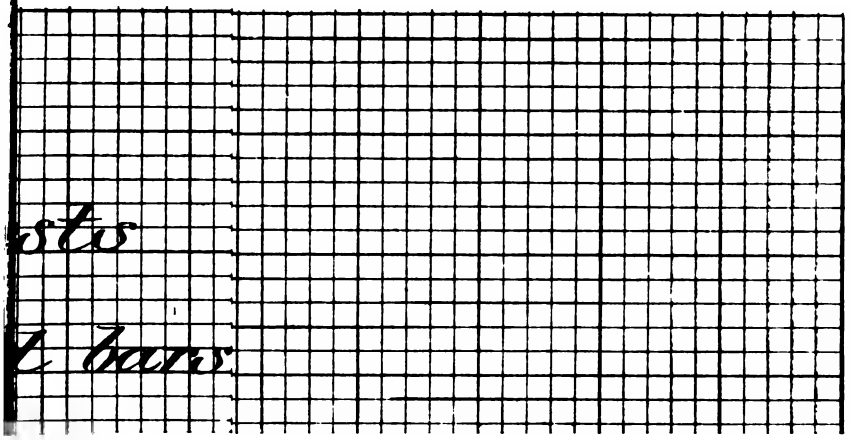
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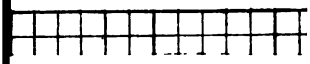

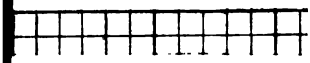

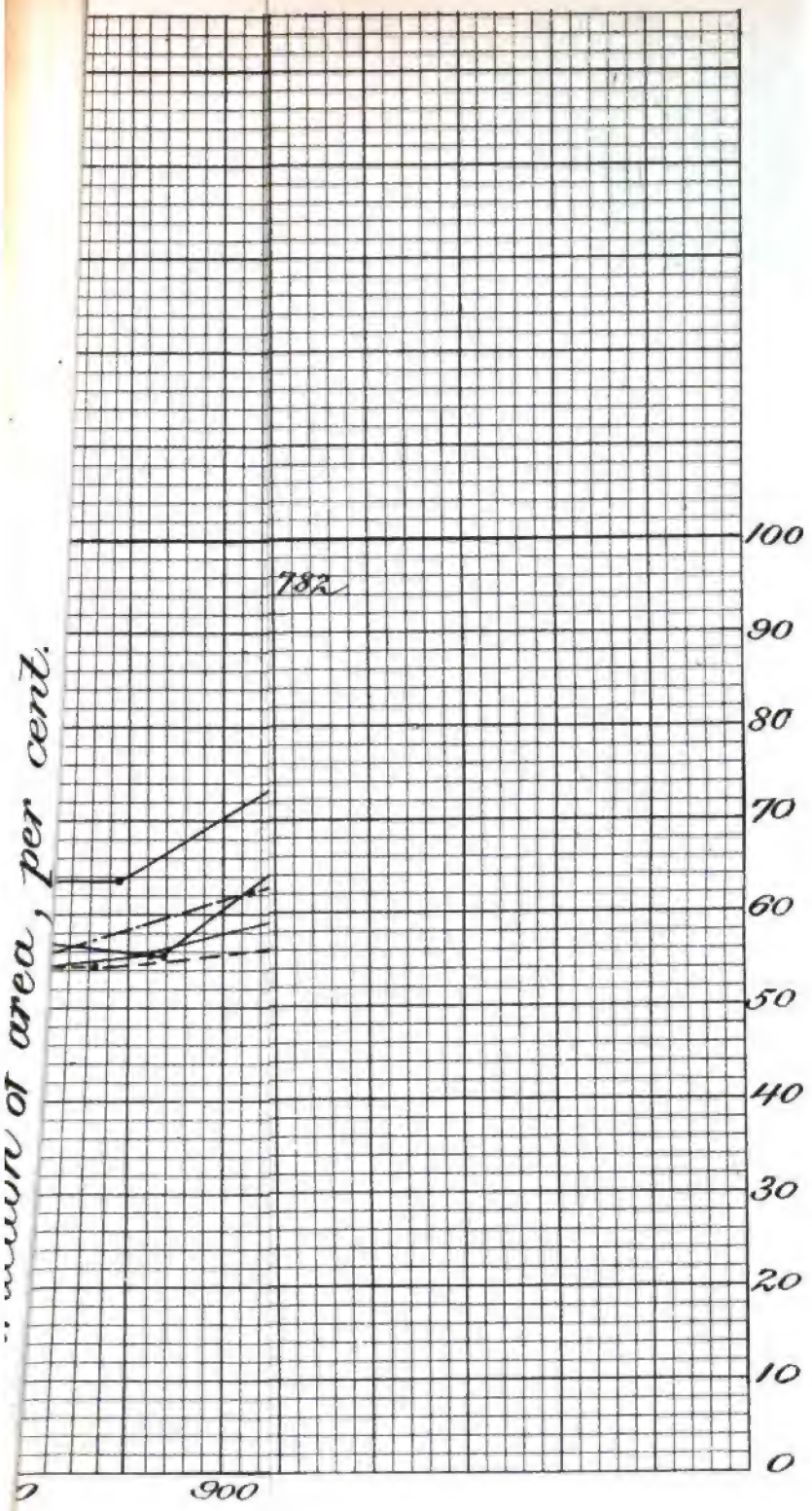
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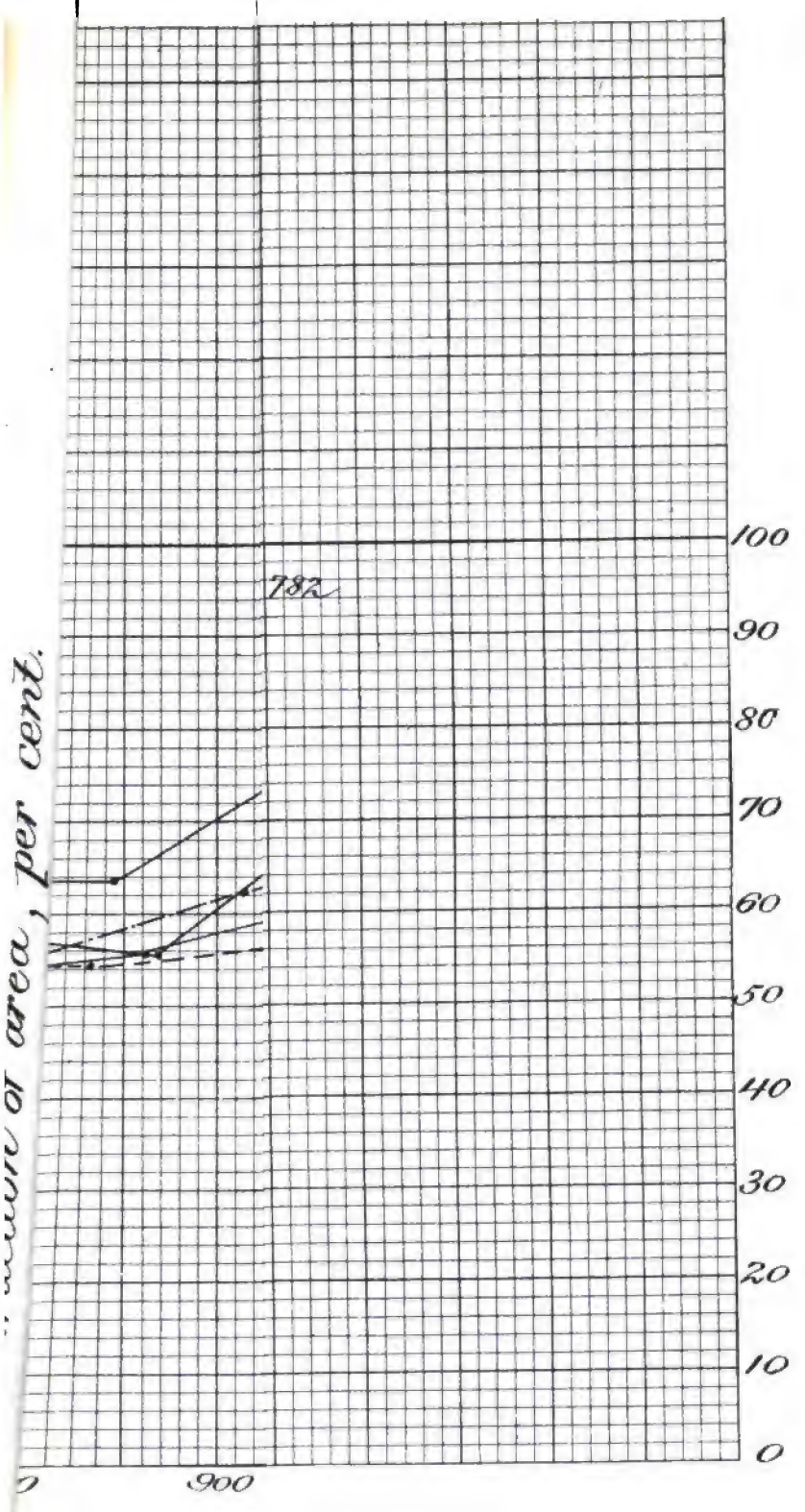
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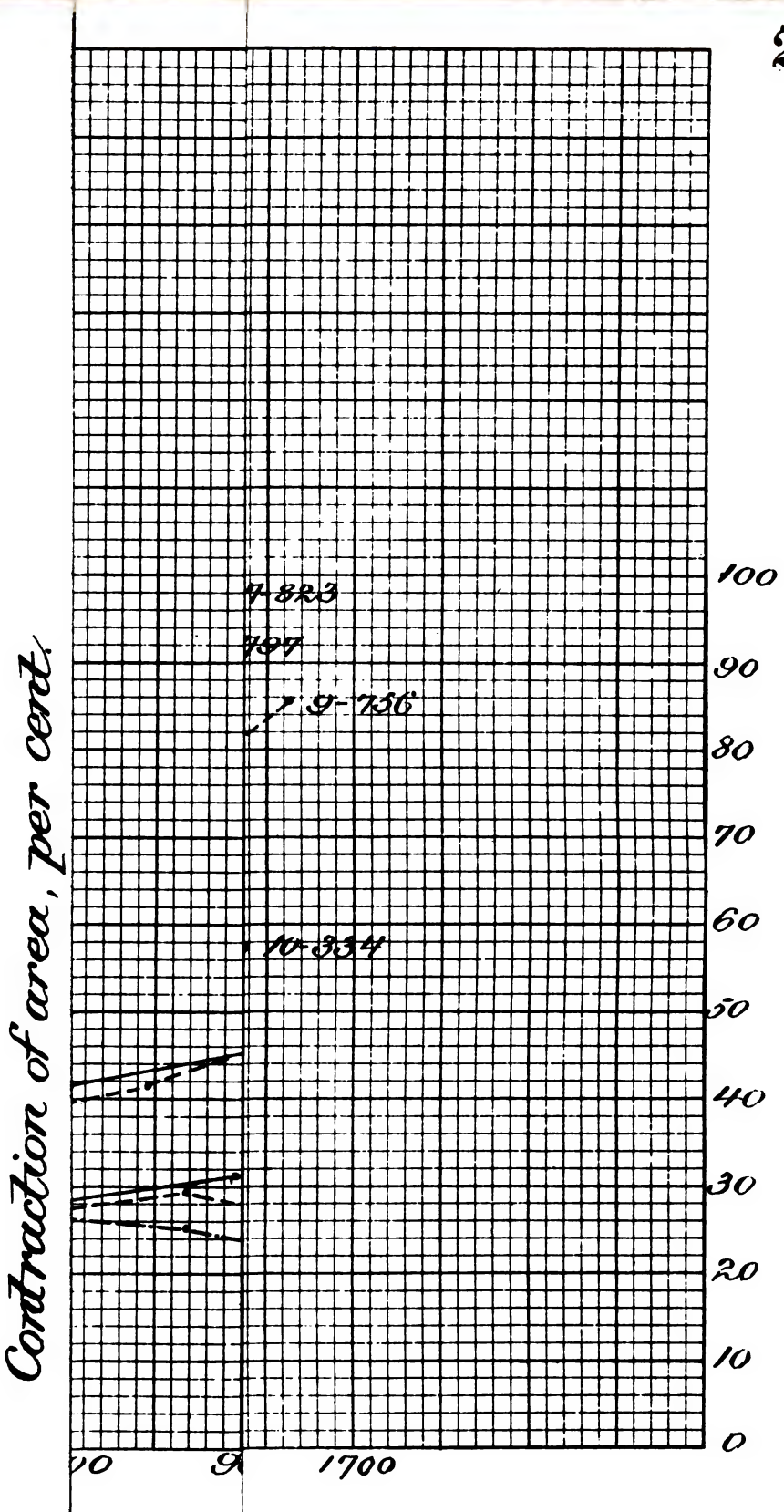
Contraction of area, per cent.
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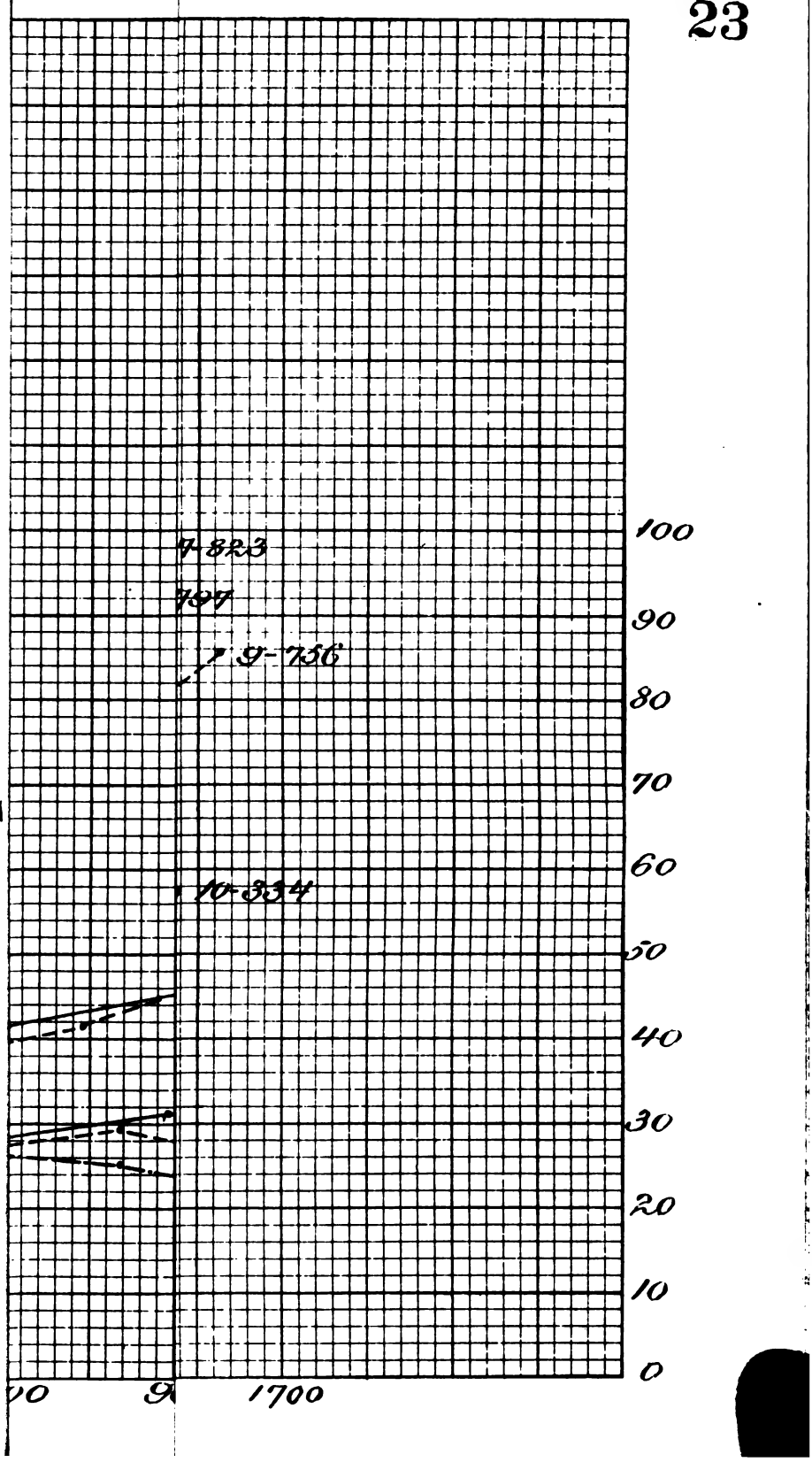
Contraction of area, per cent.
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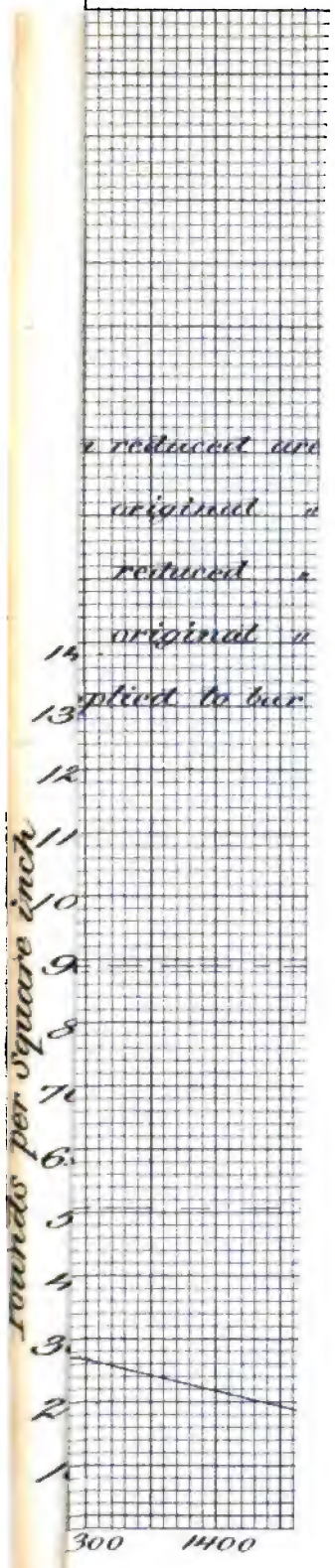
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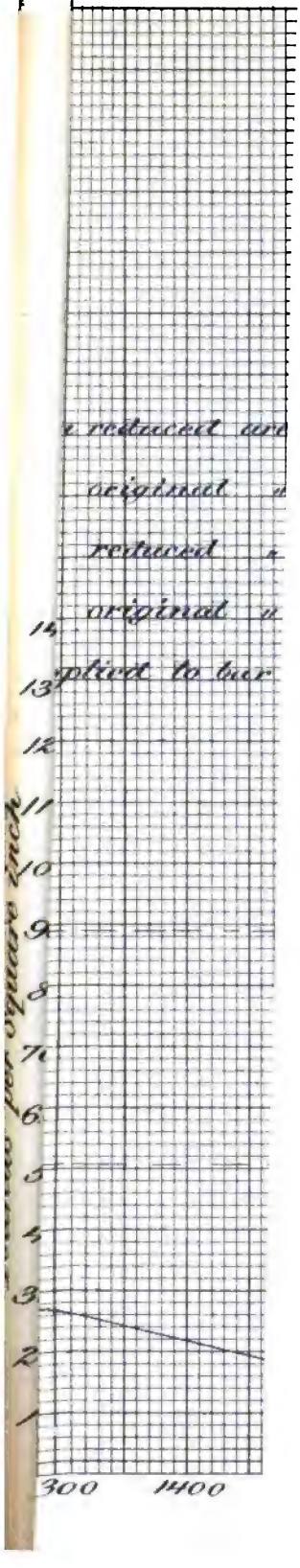
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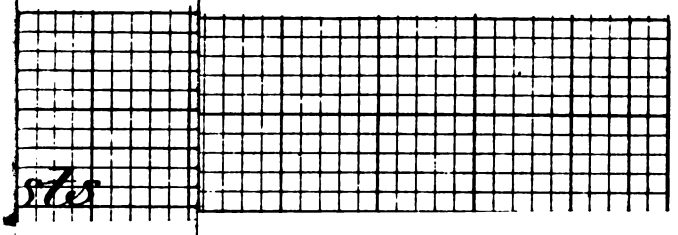
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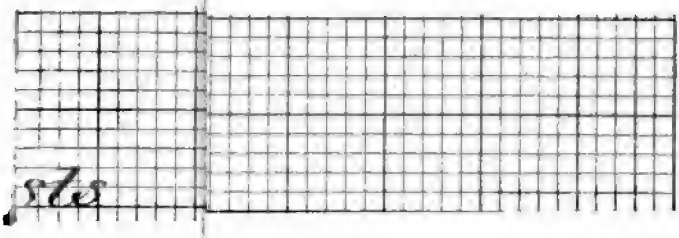
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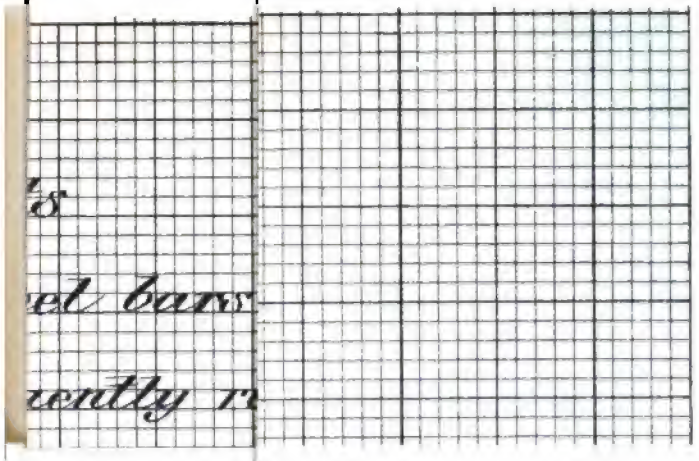

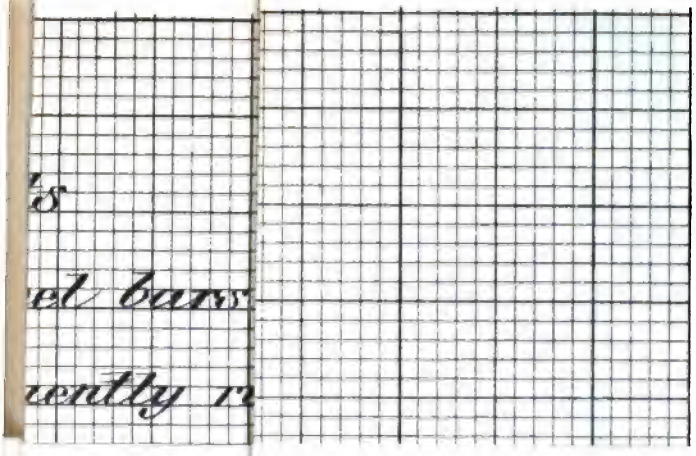

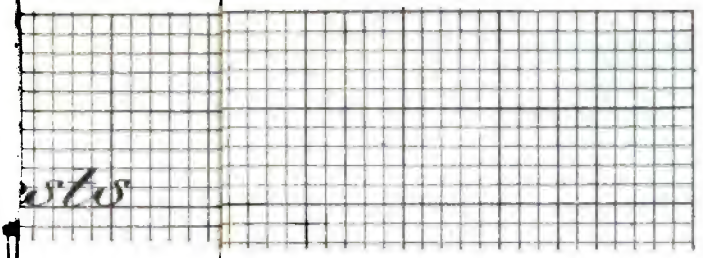

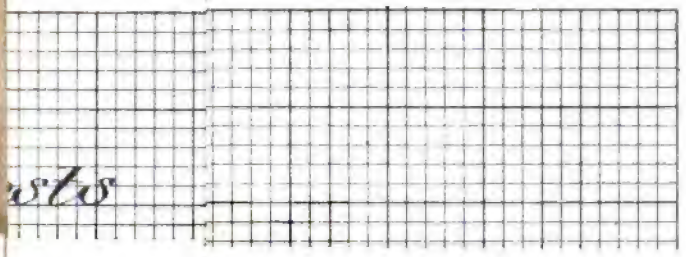

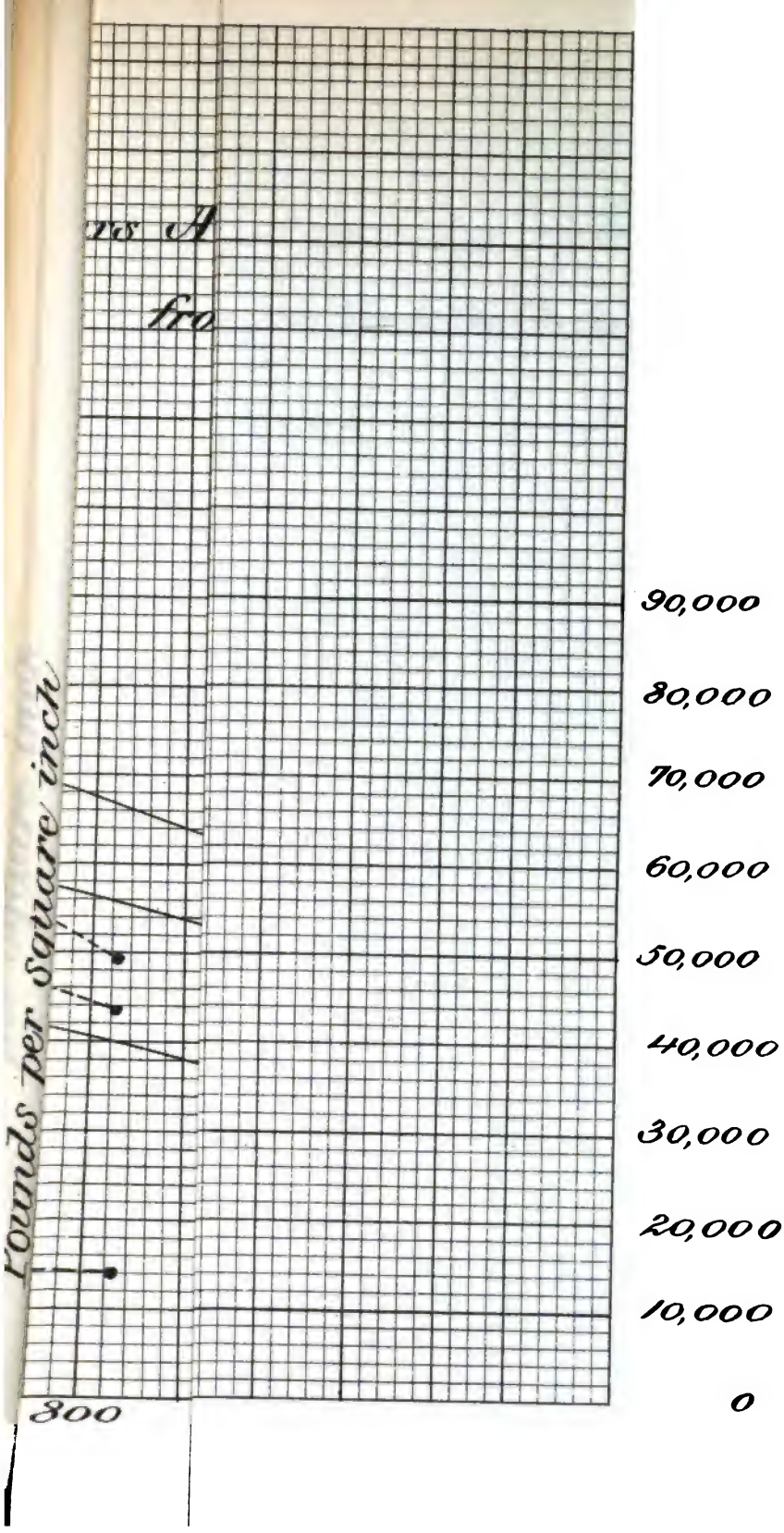
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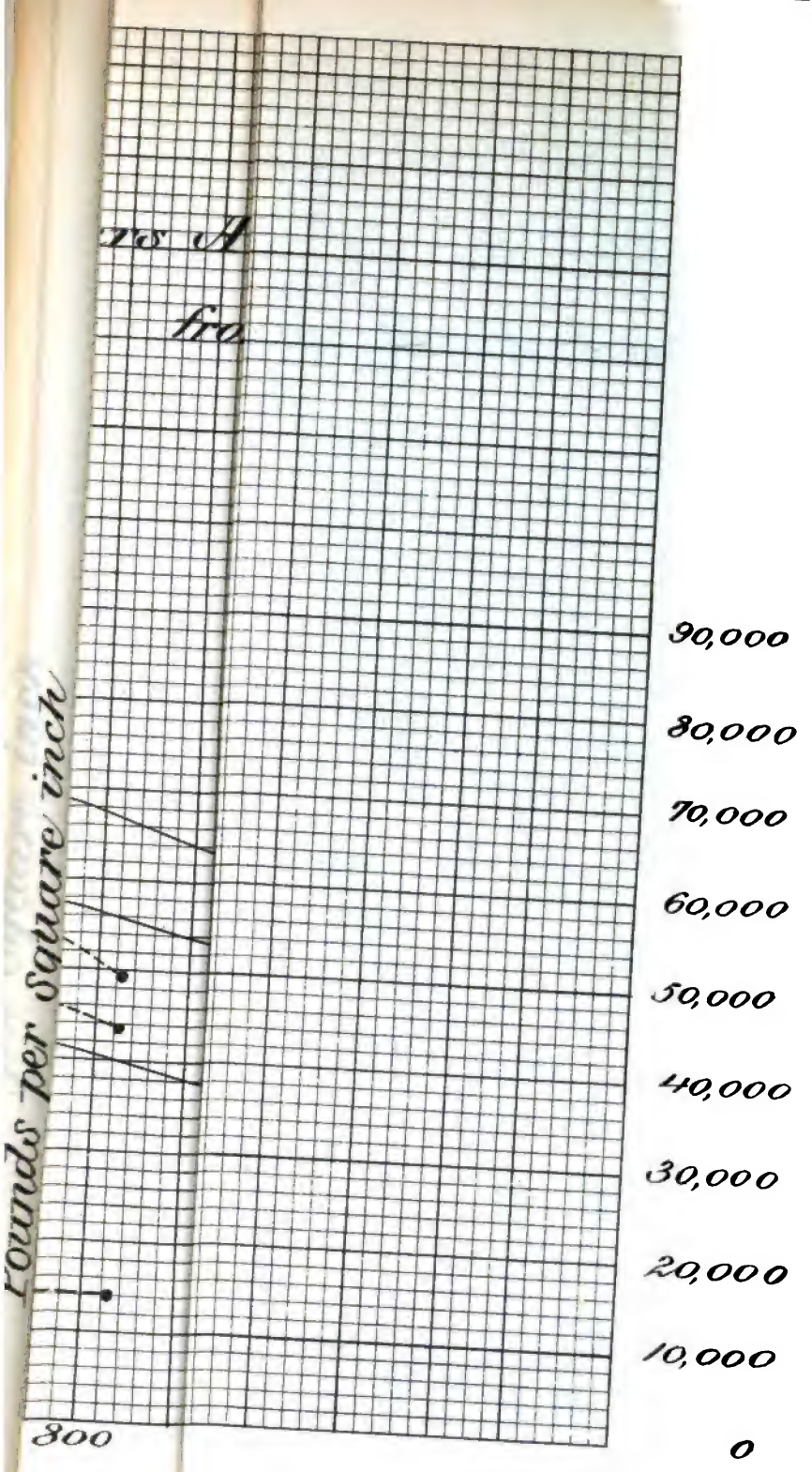
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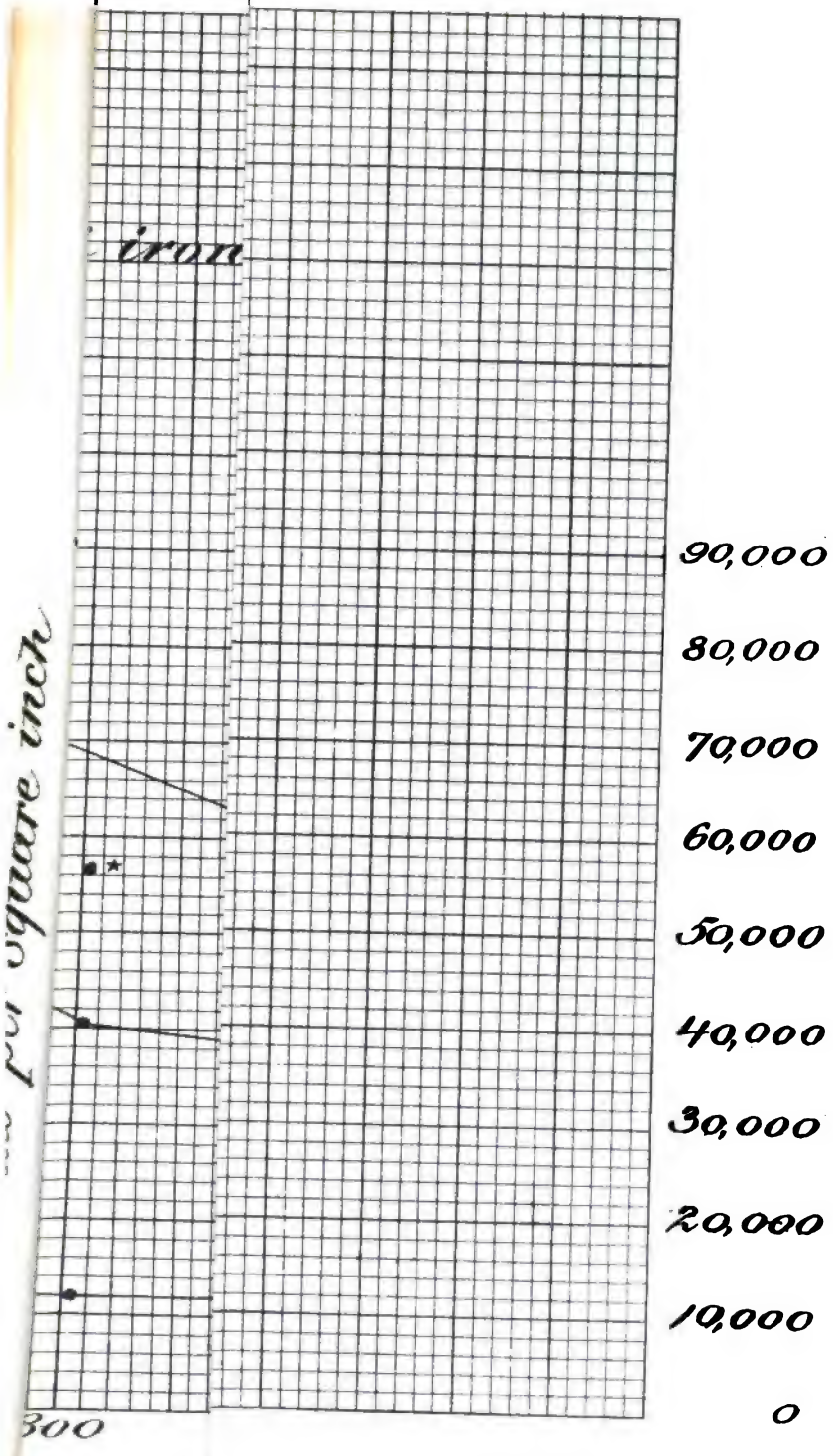
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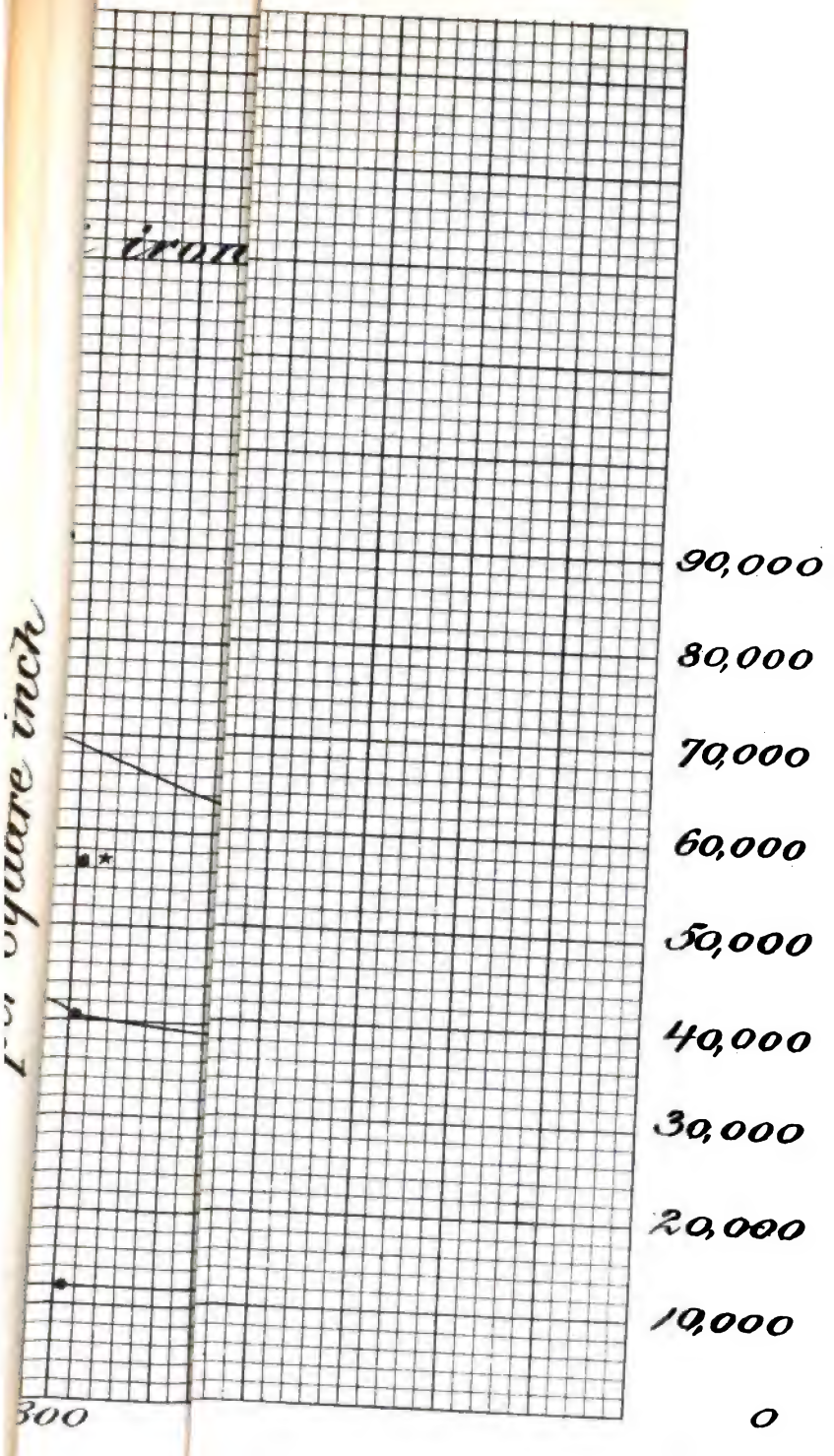
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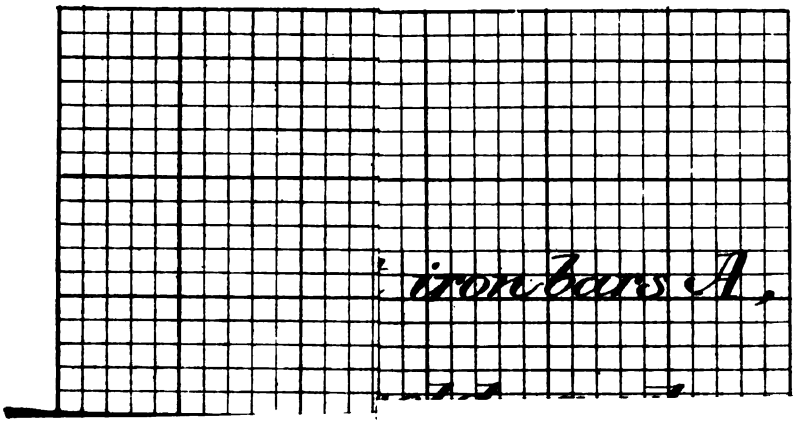
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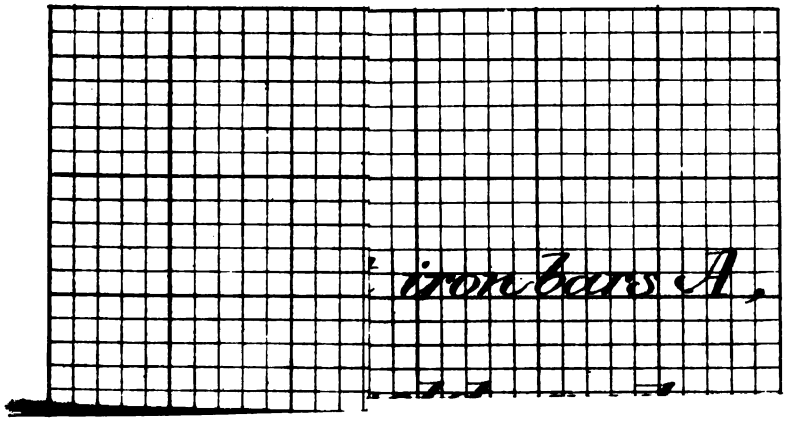
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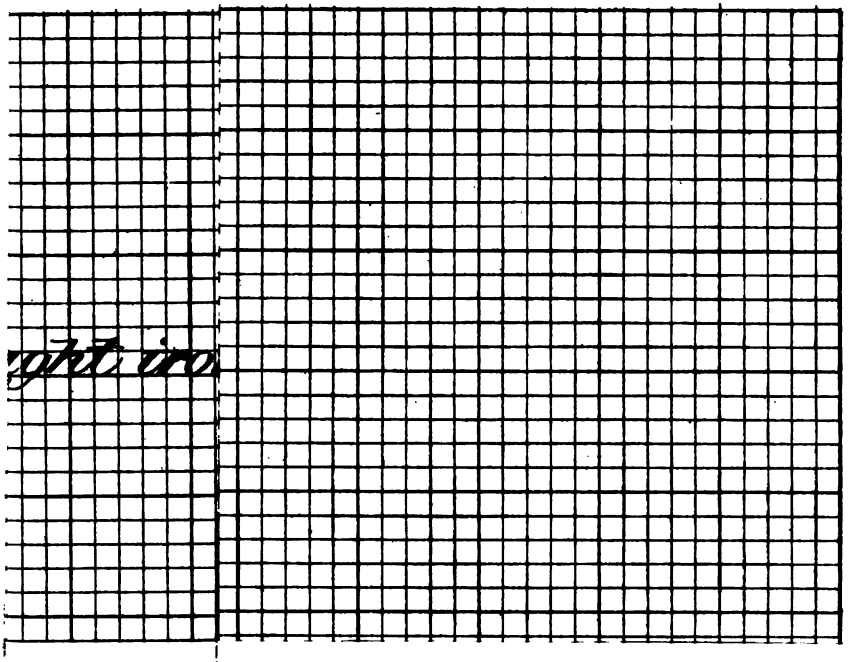

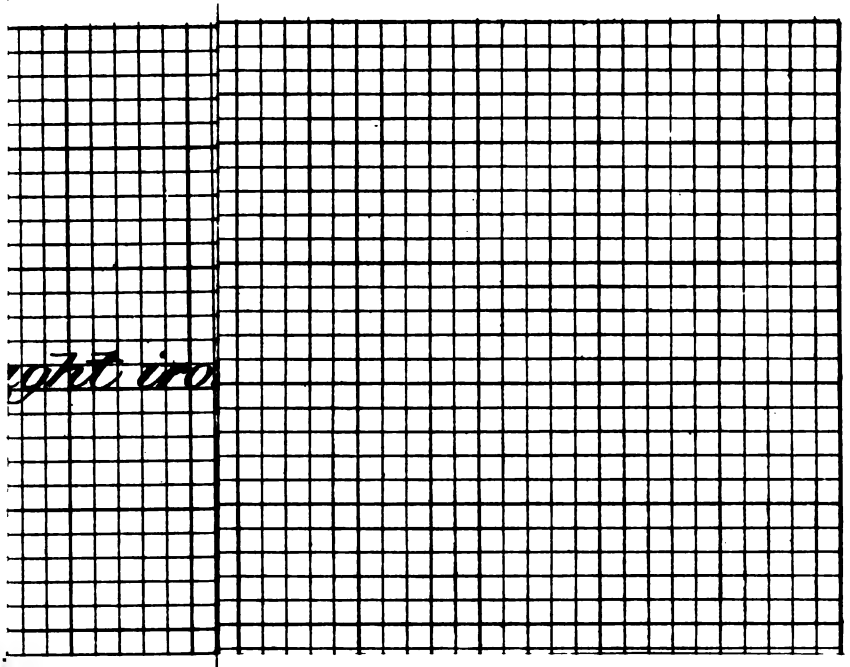
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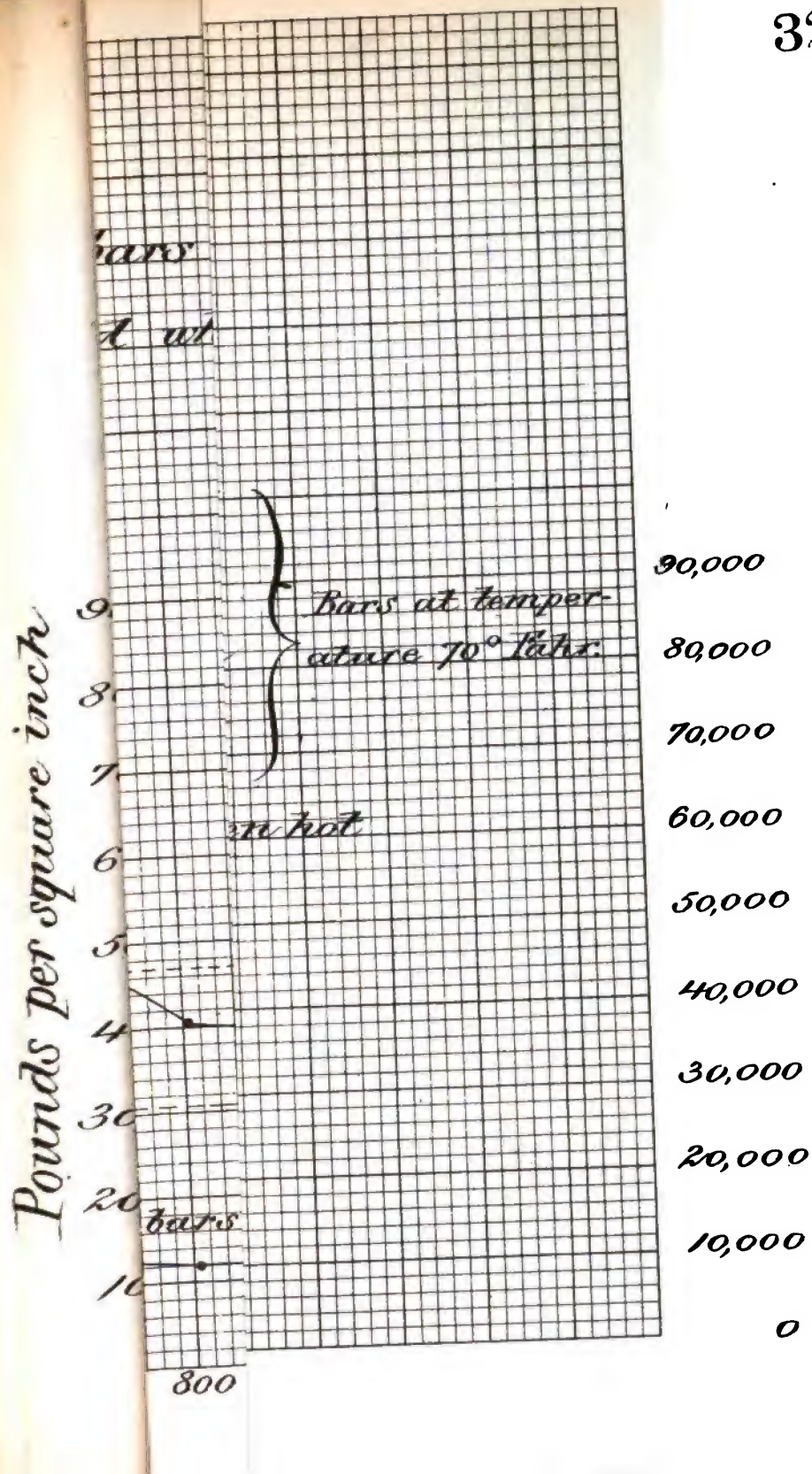
Pounds per square inch
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Bars at temperature 70° Fahr.
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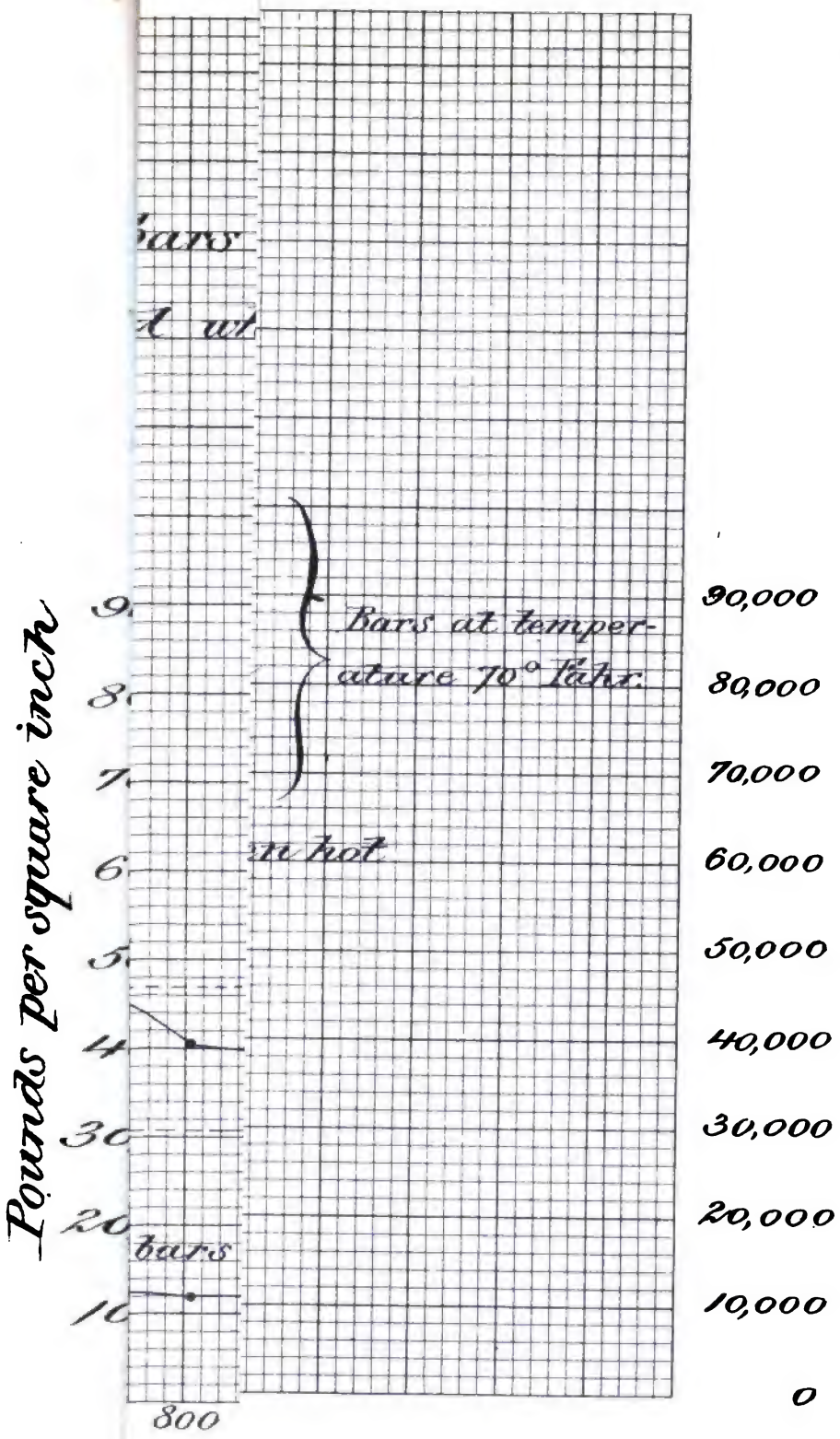
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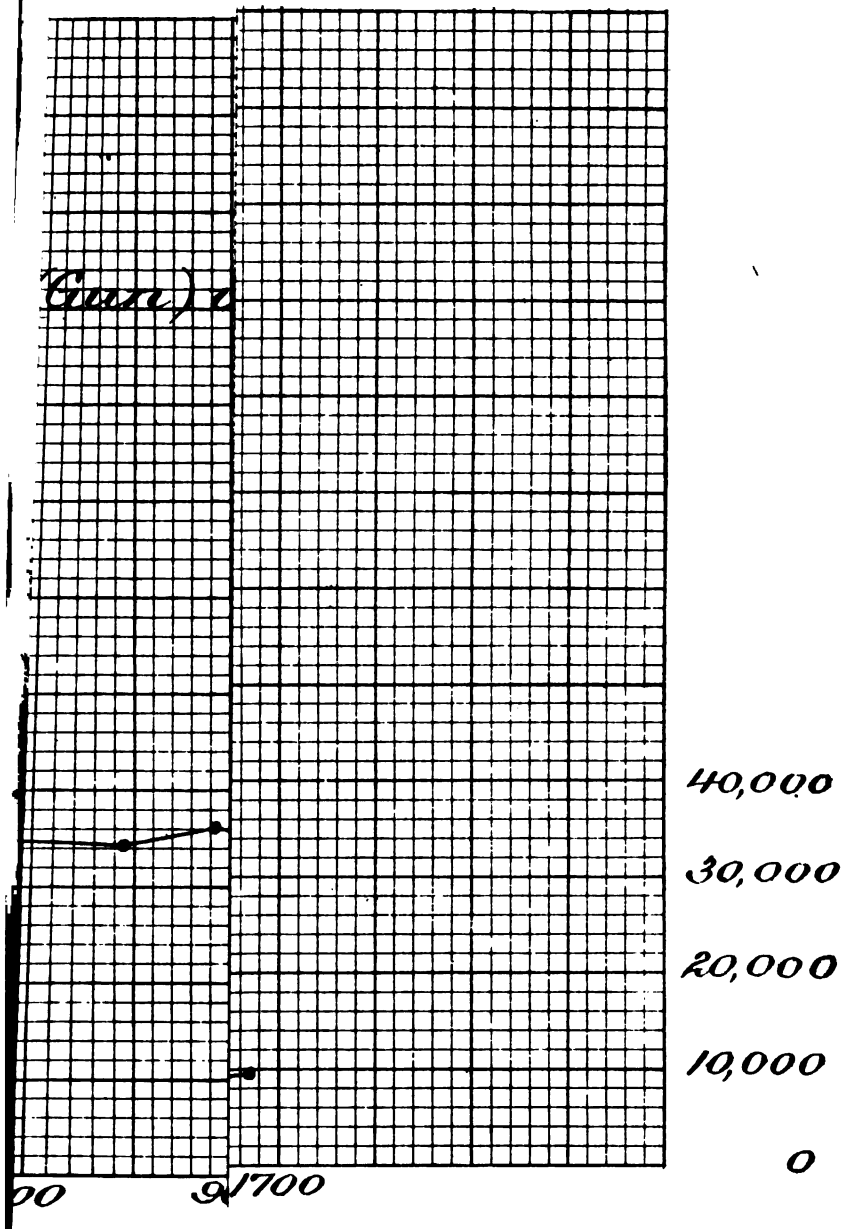
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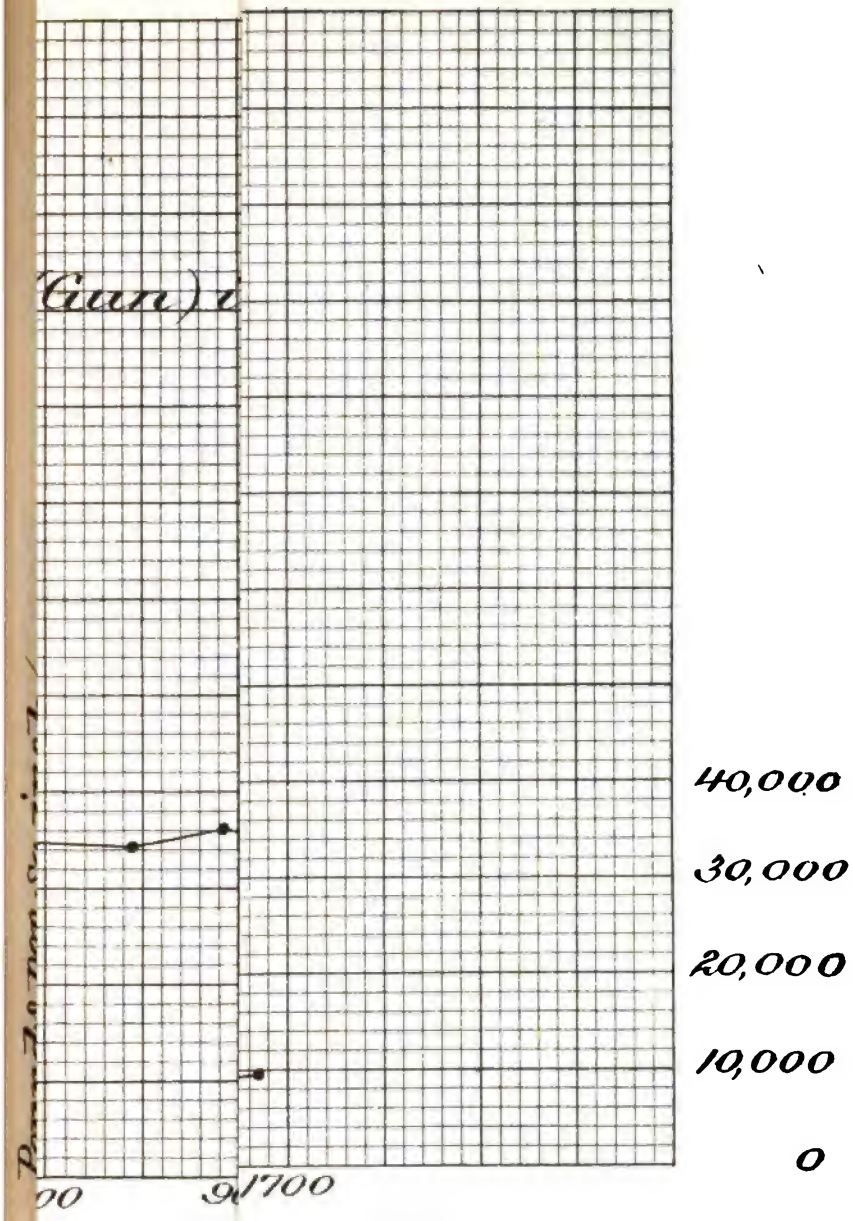
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TEMPERATURE TESTS.

TABULATION OF TENSILE TESTS OF STEEL BARS MARKED 1–823.

[Chemical composition: Carbon, .09; manganese, .11.]

No. of test.	Estimated temperature.	Elastic limit.		Tensile strength.			Load at rupture.		Elongation.		Contraction of area.	Appearance of fracture when cooled.	Color of stem when cooled.
		Per square inch.	Per cent. of cold bar.	Total.	Per square inch.	Per cent. of cold bar.	Total.	Per square inch.	Under maximum load.	After rupture.			
	°*Fahr.*	*Pounds.*		*Pounds.*	*Pounds.*		*Pounds.*	*Pounds.*	*Per cent.*	*Per cent.*	*Per cent.*		
1770	0	35,000	106.1	27,680	55,360	104.8	19,500	117,470	21.6	34.2	66.8	Silky	
1807	70	33,000	100.0	26,410	52,820	100.0	18,100	109,040	23.6	34.4	66.8	....do	
1859	195	32,200	97.6	25,680	51,360	97.2	18,500	102,210	22.4	27.0	63.8	....do	Pale yellow.
1740	334	29,000	87.9	31,000	62,000	117.4	25,000	113,120	8.2	20.4	55.8	....do	
1860	460	25,800	78.2	33,220	66,440	125.8	24,900	108,736	15.8	25.6	54.2	....do	Straw.
1742	492	25,000	75.8	32,280	64,560	122.2	26,100	118,100	9.2	18.6	55.8	Silky, faint straw color	Do.
1741	616	18,000	54.5	32,600	65,200	123.4	26,506	115,720	10.8	17.6	54.2	....do	Purple and blue.
1735	731	23,000	69.7	27,080	54,160	102.5	16,000	88,400	16.2	.....	63.8	Silky, blue black	Blue black, dark spots.
1739	845	17,000	51.5	28,620	57,240	108.4	18,800	103,870	19.0	29.0	63.8	Silky, dark blue	Dark blue.
1861	934	16,000	48.5	21,400	42,800	81.0	11,600	92,060	27.4	45.6	74.8	Silky, blue black	Blue black.
1738	1021	6,000	18.2	9,600	19,200	36.4	.....	.....	6.6	26.2	90.9	....do	Do.
1737	1045	8,000	24.2	12,500	25,000	47.3	.....	.....	1.0	28.6	86.8	Silky, dark blue	Dark blue, darker spots.
1862	1235	8,000	24.2	8,720	17,440	33.0	.....	.....	8.4	33.6	91.0	....do	Do.

TABULATION OF TENSILE TESTS OF STEEL BARS MARKED 2–123.

[Chemical composition: Carbon, .20; manganese, .45.]

1771	0	42,000	110.5	36,050	72,100	104.3	31,700	116,120	18.3	26.2	45.4	Silky	
1808	70	38,000	100.0	34,580	69,160	100.0	.....	.....	.....	26.2	41.6	.. do	
1863	201	37,400	98.4	33,220	66,440	96.1	29,700	112,500	15.7	20.2	47.2	.. do	Light straw.
1748	306	34,000	89.5	34,700	69,400	100.3	.....	.....	.....	12.6	39.6	Silky, oblique 46°	Pale straw.
1745	384	35,600	93.7	37,000	74,000	107.0	34,000	112,550	8.2	15.0	39.6	Silky	Do.
1747	437	35,600	93.7	38,700	77,400	111.9	35,200	112,820	11.2	16.6	37.6	Silky, oblique 53°	Straw.
1746	545	30,000	78.9	40,400	80,800	116.8	37,400	105,950	12.8	15.6	29.4	Silky, oblique 50°	Straw and purple.
1749	668	22,000	57.9	39,600	79,200	114.5	35,100	112,500	15.0	19.8	37.6	Silky, oblique 48°, purple	Dark blue.
1864	736	20,000	52.6	35,060	70,120	101.4	25,900	108,820	12.2	24.8	52.4	Silky, dark blue	Do.
1751	779	16,000	42.1	30,600	61,200	88.5	21,000	99,060	14.2	20.2	57.6	....do	Do.
1752	869	16,000	42.1	29,800	59,600	86.2	21,000	95,020	12.7	18.2	55.8	....do	Dark blue and red.
1865	959	21,200	55.8	25,000	50,000	72.3	12,400	81,580	13.0	34.4	69.6	....do	Dark blue and brownish.
1866	1050	17,000	44.7	19,780	39,560	57.2	.....	.....	7.6	21.4	72.2	Silky, blue black	Dark blue.
1743	1176	10,000	26.3	13,560	27,120	39.2	.....	.....	13.6	27.4	80.8	Silky, dark blue	Do.
1750	1397	.....	.....	10,600	21,200	30.7	.....	.....	17.8	32.0	85.8	Silky, blue black	Blue black and red.
1867	1572	5,000	13.2	5,000	10,000	14.5	.....	.....	5.3	34.2	97.0	Silky, dark blue	Dark blue.

TEMPERATURE TESTS—Continued.

TABULATION OF TENSILE TESTS OF STEEL BARS MARKED 3-182.

[Chemical composition: Carbon. .31; manganese, .57.]

No. of test.	Estimated temperature.	Elastic limit.		Tensile strength.			Load at rupture.		Elongation.		Contraction of area.	Appearance of fracture when cooled.	Color of stem when cooled.
		Per square inch.	Per cent. of cold bar.	Total.	Per square inch.	Per cent. of cold bar.	Total.	Per square inch.	Under maximum load.	After rupture.			
	°*Fahr.*	*Pounds.*		*Pounds.*	*Pounds.*		*Pounds.*	*Pounds.*	*Per cent.*	*Per cent.*	*Per cent.*		
1772	0	48, 720	105.9	42, 180	85, 630	104.5	37, 000	114, 910	15.6	22.4	35.6	Granular	
1809	70	46, 000	100.0	40, 990	81, 980	100.0	35, 300	129, 300	.....	25.0	45.4	Silky, slightly granular	
1755	223	42, 000	91.3	39, 400	78, 800	96.1	34, 000	128, 790	13.4	20.0	47.2	...do	
1754	339	42, 000	91.3	44, 800	89, 600	109.3	42, 200	123, 390	.....	14.0	31.6	...do	
1753	431	40, 000	87.0	45, 800	91, 600	111.7	42, 400	123, 980	10.4	15.2	31.6	...do	Straw.
1756	569	33, 000	71.7	47, 700	95, 400	116.4	38, 500	136, 040	16.2	24.4	43.4	Silky, indigo blue	Indigo blue.
1869	651	26, 000	56.5	43, 600	87, 200	106.4	30, 200	138, 650	12.2	24.2	55.8	Silky, dark blue	Blue black.
1759	738	26, 000	56.5	42, 250	84, 500	103.1	30, 600	133, 620	13.8	23.6	54.2	Silky, blue	Blue.
1757	832	24, 000	52.2	41, 800	83, 600	102.0	30, 000	131, 000	14.2	24.2	54.2	Silky, blue black	Blue black.
1758	960	19, 000	41.3	35, 100	70, 200	85.6	22, 600	106, 600	9.0	15.6	57.6	Silky, dark blue	Do.
1871	1021	20, 000	43.5	28, 060	56, 120	68.5	15, 800	87, 290	10.4	26.8	63.8	...do	Blue and brownish.
1760	1106	18, 000	39.1	27, 200	54, 400	66.4	15, 700	80, 100	8.1	14.6	60.8	Fine silky, blue black	Blue black.
1872	1198	12, 000	26.1	18, 500	37, 000	45.1	8, 300	62, 880	15.8	31.0	73.6	Silky, dark blue	Dark blue.
1870	1208	12, 000	26.1	15, 000	30, 000	36.6	.....	.....	17.2	22.8	74.8	...do	Do.
1762	1313	9, 000	19.6	12, 200	24, 400	29.8	.....	.....	9.6	24.6	89.4	...do	Do.
1761	1351	8, 000	17.4	15, 850	31, 700	38.7	.....	.....	9.1	30.6	80.8	Silky, medium blue	Medium blue.
1874	1451	8, 000	17.4	8, 260	16, 520	20.2	.....	.....	4.7	23.4	94.4	Fracture not completed	Blue black.
1873	1620	4, 000	8.7	5, 680	11, 360	13.9	.....	.....	7.9	36.0	95.4	...do	Do.

TABULATION OF TENSILE TESTS OF STEEL BARS MARKED 4-795.

[Chemical composition: Carbon, .37; manganese, .70.]

1778	0	50, 400	105.0	44, 540	89, 080	103.8	38, 600	119, 580	16.4	22.2	35.6	Granular	
1810	70	48, 000	100.0	42, 900	85, 800	100.	36, 900	135, 160	.....	24.0	45.4	Silky	
1764	215	45, 200	94.2	41, 700	83, 400	97.2	29, 200	125, 640	13.8	17.6	37.6	...do	
1763	317	42, 000	87.5	44, 000	88, 000	102.6	42, 000	130, 430	7.1	12.2	35.6	...do	
1767	440	44, 800	93.3	49, 490	98, 980	115.4	45, 900	134, 210	10.6	13.8	31.6	...do	Straw.
1765	570	36, 000	75.0	49, 720	99, 440	115.9	48, 100	142, 720	13.4	18.2	39.6	...do	
1779	642	32, 000	66.7	48, 350	96, 700	112.8	38, 400	140, 660	13.3	20.6	45.4	Silky, deep blue	Brown and checkered spots.

			58.3	45,460	90,920	106.0	22,500	94,540	13.2	24.0	52.4	Silky, dark blue	Blue black and purple.
1768	912	26,000	54.2	36,680	73,360	85.5	20,000	105,820	9.8	26.2	62.2	....do	Do.
1769	1020	22,000	45.8	32,300	64,600	75.3	19,500	99,490	8.3	14.8	60.8	Silky	
1878	1192	16,000	33.3	18,760	37,520	43.7			7.2	28.8	80.8	Silky, dark blue	Blue black and brownish
1879	1285	12,000	25.0	13,940	27,880	32.5			4.6	21.6	85.8	Silky, blue black	Do.
1781	1285			18,400	36,800	42.9			12.0	29.6	79.6	Silky, dark blue	Dark blue.
1782	1572			6,850	13,700	16.0			14.2	54.2	98.9	Silky, blue black	Blue black.

TABULATION OF TENSILE TESTS OF STEEL BARS MARKED 5-803.

[Chemical composition: Carbon, .51; manganese, .58; silicon, .02.]

1774	5	58,000	103.6	49,700	99,400	103.9	41,000	160,780	13.8	20.6	49.0	Silky	
1811	70	56,000	100.0	47,820	95,640	100.0	41,200	150,910		22.0	45.4	....do	
1783	272	51,400	91.8	48,600	97,200	101.6	41,800	147,700		16.4	43.4	....do	Light straw.
1788	448	49,000	87.5	54,300	108,600	113.6	52,000	135,060	11.6	12.8	23.0	Silky, oblique	Do.
1784	503	45,000	80.4	55,280	110,560	115.6	51,000	144,480	14.4	18.8	29.4	Silky, dark straw color	Straw, purple, and blue.
1787	594	42,000	75.0	55,190	110,380	115.4	51,200	141,050	15.1	18.8	27.4	Silky, brown purple	Blue and purple.
1883	712	34,000	60.7	46,890	93,780	98.1	32,600	136,970	9.0	17.2	52.4	Silky, dark blue	Dark blue and purple.
1785	861	30,000	53.6	44,950	89,900	94.0	29,400	133,030	9.5	18.0	55.8	....do	Blue black, checkered.
1884	1113	30,000	53.6	26,060	52,120	54.5	13,600	85,530	9.2	22.8	68.2	....do	Dark blue.
1786	1319	14,000	25.0	17,000	34,000	35.6			2.5	16.4	80.8	Silky, blue black	Blue black.

TABULATION OF TENSILE TESTS OF STEEL BARS MARKED 6-797.

[Chemical composition: Carbon, .57; manganese, .93; silicon, .07.]

1775	5	62,000	103.3	60,560	121,120	102.7	58,600	143,980	12.0	13.6	18.6	Granular	
1812	70	60,000	100.0	58,960	117,920	100.0	57,600	145,450	11.0	13.2	20.8	....do	
1789	214	57,000	95.0	55,920	111,840	94.8	53,800	148,210	11.0	13.4	27.4	Silky, trace of granulation.	
1888	315	57,600	96.0	59,500	119,000	100.9	56,800	144,470	6.7	7.6	18.6	Silky, 50 per cent.; granular, 50 per cent.	Pale straw.
1890	342	57,200	95.3	59,200	118,400	100.4				7.4	20.8	Silky, trace of granulation.	
1793	422	51,000	85.0	64,120	128,240	108.7	63,800	152,270	7.6	8.0	16.2	Silky, straw color	Straw.
1790	587	46,000	76.7	66,520	133,040	112.8	64,800	154,650	12.6	13.8	16.2	Silky, purple brown	Brown, with blue spots.
1794	676	51,000	85.0	60,600	121,200	102.8	50,200	155,900	9.6	16.4	35.6	Silky, dark blue	Blue black and greenish.
1885	801	46,000	76.7	52,920	105,840	89.8	40,600	139,040	6.9	13.4	41.6	....do	Dark blue, checkered.
1792	953	43,000	71.7	45,400	90,800	77.0	39,200	118,480	7.4	15.6	47.2	Silky, blue black	Blue black.
1886	1008	34,000	56.7	33,670	67,340	57.1	18,600	81,220	5.0	17.6	54.2	....do	Do.
1887	1274	20,000	33.3	19,520	39,040	33.1			4.0	15.0	72.2	....do	Do.
1791	1603			10,500	21,000	17.9			4.0	23.8	91.6	Silky, dark blue	Blue.

TEMPERATURE TESTS—Continued.

TABULATION OF TENSILE TESTS OF STEEL BARS MARKED 7–823.

[Chemical composition: Carbon, .71; manganese, .58; silicon, .66.]

No. of test.	Estimated temperature.	Elastic limit.		Tensile strength.			Load at rupture.		Elongation.		Contraction of area.	Appearance of fracture when cooled.	Color of stem when cooled.
		Per square inch.	Per cent. of cold bar.	Total.	Per square inch.	Per cent. of cold bar.	Total.	Per square inch.	Under maximum load.	After rupture.			
	°*Fahr.*	*Pounds.*		*Pounds.*	*Pounds.*		*Pounds.*	*Pounds.*	*Per cent.*	*Per cent.*	*Per cent.*		
1776	8	61,000	105.2	60,300	121,600	103.3	58,700	152,470	11.0	12.0	23.6	Granular	
1813	70	58,000	100.0	58,880	117,760	100.0	55,900	149,470	11.6	14.6	25.2	do	
1795	263	55,000	94.8	56,200	112,400	95.4	54,700	146,260	9.6	9.4	25.2	Silky, slightly granular	
1796	341	54,000	93.1	60,400	120,800	102.6	60,000	147,420	.....	7.6	18.6	Silky	Light straw.
1797	488	46,000	79.3	66,100	132,200	112.3	.....	.....	10.6	11.2	16.2	Silky, straw color	Purple and blue.
1923	640	48,000	82.8	64,380	124,760	105.9	51,500	165,060	11.6	18.4	37.6	Silky, deep blue	Blue black and brown.
1798	701	46,000	79.3	58,960	117,920	100.1	49,500	153,730	9.3	15.4	35.6	Silky, blue black	Do.
1799	846	38,000	65.5	51,100	102,200	86.8	37,400	128,080	7.5	14.8	41.6	do	Do.
1800	1006	39,000	67.2	40,000	80,000	67.9	23,200	97,480	4.8	16.6	52.4	do	Do.
1924	1024	36,000	62.1	34,770	69,540	59.1	20,500	83,360	4.2	15.8	50.8	do	Do.
1921	1158	30,000	51.7	29,300	58,600	49.8	14,000	68,630	6.7	20.6	59.2	Silky, spongy, dark blue.	Do.
1926	1320	20,000	34.5	17,520	35,040	29.7	1,800	12,950	3.1	21.6	72.2	do	Dark blue.
1925	1503	.....	.....	11,000	22,000	18.7	.....	.....	2.5	26.2	85.0	Silky, spongy, blue black.	Blue black.
1922	1627	.....	.....	6,020	12,040	10.2	.....	.....	.....	34.2	97.4	do	Do.

TABULATION OF TENSILE TESTS OF STEEL BARS MARKED 8–750.

[Chemical composition: Carbon, .81; manganese, .56; silicon, .17.]

1777	10	74,000	102.8	76,750	153,500	101.9	76,750	164,700	.....	7.0	6.8	Granular	
1946	70	.....	.....	75,800	151,600	100.6	.....	.....	.....	8.0	11.6	do	
1814	70	72,000	100.0	75,300	150,600	100.0	75,300	165,860	.....	7.6	9.2	do	
1801	242	70,000	97.2	71,850	143,700	95.4	.....	.....	8.0	7.2	11.6	do	
1945	271	.....	.....	70,600	141,200	93.7	.....	.....	.....	7.4	14.0	do	
1933	378	68,000	94.4	74,600	149,200	99.1	.....	.....	5.0	5.2	9.2	do	Straw.
1803	512	58,000	80.6	81,750	163,500	108.6	81,750	180,070	7.9	7.6	9.2	Granular, slightly browned.	Light blue and purple.
1936	542	58,000	80.6	81,750	163,500	108.6	81,000	183,260	9.8	11.2*	11.6	Granular, dark brown	Blue and purple.
1944	585	.....	.....	78,500	157,000	104.2	.....	.....	.....	7.6	9.2	do	Blue.
1802	649	63,000	87.5	75,000	150,000	99.6	72,600	173,270	8.6	10.2	10.2	Silky, with granular ring; blue color	Brown, checkered with * blue-black spots.
		0	77.8	70,580	141,160	93.7	59,600	164,190	6.6	12.4	27.4	Silky, deep blue	Blue black and bronze.
1804	768	54,000	75.0	68,680	139,360	92.5	58,800	161,980	7.0	12.6	27.4	Silky, blue black	Blue black.

1943	815	.....	.....	70,500	141,000	93.6	.....	.....	.....	16.0	31.6	Silky, light greenish blue.	Brown, blue-black spots.
1935	1035	44,000	61.1	57,940	115,880	76.9	42,900	125,440	6.0	17.0	31.6	Silky, greenish blue...	Blue black.
1932	1082	44,000	61.1	47,100	94,200	62.5	37,100	99,200	4.7	11.0	25.2	Silky, spongy, light blue.	Do.
1942	1121	.....	.....	48,000	96,000	63.7	.....	.....	.....	16.0	35.6	Silky, spongy, dark greenish.	Do.
1941	1174	32,000	44.4	34,160	68,320	45.4	27,200	70,650	3.7	13.4	23.9	Silky, spongy, blue black.	Do.
1806	1239	26,000	34.7	25,800	51,600	34.3	18,500	52,410	2.9	7.0	29.4	Silky, blue black	Do.
1940	1410	10,000	6.6	16,620	33,240	22.1	3,500	17,160	2.3	12.8	59.2	Silky, spongy, blue black.	Do.
1939	1410	.....	.....	31,500	63,000	41.8	.....	.....	.....	10.2	25.2	.....do.....	Do.
1938	1555	.....	.....	21,000	42,000	27.9	.....	.....	.....	18.8	37.6	.....do.....	Do.
1937	1620	.....	.....	16,000	32,000	21.2	.....	.....	.....	18.6	66.8	.....do.....	Do.
1934	1641	.....	.....	7,000	14,000	9.3	.....	.....	.....	31.0	83.8	Silky, spongy, dark blue.	Dark blue.

TABULATION OF TENSILE TESTS OF STEEL BARS MARKED 9-756.

[Chemical composition: Carbon, .89; maganese, .57; silicon, .19.]

1778	10	83,000	102.5	77,000	154,000	99.6	77,000	165,240	5.6	4.6	6.8	Granular, flaky	
1815	70	81,000	100.0	77,300	154,600	100.0	77,300	170,260	.....	6.6	9.2	.....do.....	
1816	295	72,000	88.9	72,300	144,600	93.5	72,800	163,570	7.2	6.2	11.6	.....do.....	Pale straw.
1949	377	62,000	76.5	79,600	159,200	103.0	79,600	170,810	7.2	5.6	6.8	.....do.....	Straw.
1818	498	60,000	74.1	82,100	164,200	106.2	81,600	187,160	9.6	10.6	12.8	Granular, snuff-brown.	Brownish blue.
1978	498	60,000	74.0	82,900	165,800	107.2	82,900	182,600	.....	6.2	9.2	Granular, blue.....	Blue.
1948	618	58,000	71.6	79,700	159,400	103.1	78,000	186,160	10.0	10.6	16.2	Granular, dark purple.	Brown; blue-black spots.
1817	712	54,000	66.7	70,900	141,800	91.7	60,500	161,760	6.9	11.4	25.2	Silky, dark blue.....	Blue and purple.
1977	867	56,000	69.1	61,000	122,000	78.9	49,300	139,660	.....	12.6	29.4	Irregular dark blue ...	Blue black.
1819	974	40,000	49.4	52,800	105,600	68.3	41,500	110,960	6.1	11.0	25.2	Granular, spongy, greenish blue.	Dark blue and brown.
1979	1018	.....	.....	54,900	111,130	71.9	.....	.....	.....	12.4	30.8	Irregular, blue black..	Blue black.
1820	1073	32,000	39.5	42,750	85,500	55.3	34,900	85,750	6.9	11.2	18.6	Granular, spongy, dark blue.	Do.
1821	1185	28,000	34.6	31,640	63,280	40.9	28,400	67,780	3.9	9.0	16.2	Granular, spongy, dark blue, irregular.	Do.
1976	1217	26,000	32.1	31,000	62,000	40.1	23,700	59,850	3.6	10.2	20.8	Irregular, blue black..	Do.
1822	1284	20,000	24.7	25,120	50,240	32.5	23,800	63,640	7.6	8.6	25.2	Granular, spongy, dark blue.	Dark blue.
1823	1460	6,000	7.4	14,700	29,400	19.5	.....	.....	2.9	15.6	57.6	Silky, spongy, blue black.	Blue black.
1947	1581	.....	.....	11,000	22,000	14.2	.....	.....	3.2	23.4	73.6	.....do.....	Do.
1975	1623	.....	.....	15,200	30,400	19.7	.....	.....	.....	20.0	73.6	Silky, blue black	Do.
1950	1629	.....	.....	9,000	18,000	11.6	.....	.....	.....	27.0	73.6	Silky, spongy, dark blue.	Dark blue.
1974	1663	.....	.....	9,000	18,000	11.6	1,800	25,350	3.7	28.6	85.8	Silky, blue black	Blue black.

TEMPERATURE TESTS—Continued.

TABULATION OF TENSILE TESTS OF STEEL BARS MARKED 10-334.

[Chemical composition: Carbon, .97; manganese, .80; silicon, .28.]

No. of test.	Estimated temperature.	Elastic limit.		Tensile strength.			Load at rupture.		Elongation.		Contraction of area.	Appearance of fracture when cooled.	Color of stem when cooled.
		Per square inch.	Per cent. of cold bar.	Total.	Per square inch.	Per cent. of cold bar.	Total.	Per square inch.	Under maximum load.	After rupture.			
	°*Fahr.*	*Pounds.*		*Pounds.*	*Pounds.*		*Pounds.*	*Pounds.*	*Per cent.*	*Per cent.*	*Per cent.*		
1957	70	82,000	100.0	77,000	154,000	100.0	75,500	170,810	.....	8.6	11.6	Granular.....	
1971	70	80,000	.....	77,700	155,400	.....	76,300	172,620	.....	7.4	11.6	.....do.....	
1960	265	76,000	92.7	73,980	147,960	96.1	73,300	165,840	7.9	7.4	11.6	.....do.....	
1962	384	66,000	80.5	83,700	167,400	108.7	83,300	188,460	8.0	7.4	11.6	.....do.....	Light straw.
1961	405	70,000	85.4	76,900	153,800	99.9	76,000	171,950	6.0	5.8	11.6	.....do.....	Straw.
1959	505	82,000	100.0	81,320	168,640	109.5	83,800	189,590	9.4	10.6	11.6	Granular, brown.....	Dark blue.
1958	656	62,000	75.6	74,980	149,960	97.4	61,000	172,800	7.7	13.8	29.4	Silky, spongy, dark blue.	Light purple.
1952	736	66,000	80.5	67,100	134,200	87.1	53,900	148,480	6.2	11.6	27.4	Spongy, dark blue	Dark blue.
1972	867	52,000	63.4	59,500	119,000	77.3	52,800	141,180	5.3	8.6	25.2	Silky, dark blue	Blue black.
1953	908	56,000	68.2	55,000	110,000	71.4	42,800	117,910	4.8	15.2	27.4	Spongy, greenish blue	Do.
1954	1116	40,000	48.8	39,400	78,800	51.2	32,000	76,370	4.3	11.6	16.2	Spongy, dark blue ...	Do.
1951	1384	18,000	22.0	20,600	41,200	53.5	15,500	43,900	3.5	7.6	29.4	.....do.....	Dark blue.
1973	1511	.....	.....	14,040	28,080	18.2	.....	.....	3.4	18.8	52.4	Dull silky, blue black.	Blue black.
1955	1638	.....	.....	9,300	18,600	12.1	.....	.....	3.3	23.8	57.6	Spongy, blue	Blue.

TEMPERATURE TESTS—Continued.

TABULATION OF HOT TESTS. BARS NOT RUPTURED.

No. of test.	Marks.	Estimated temperature.	Elastic limit per square inch.	Maximum load applied per square inch.	Elongation under maximum load.	Minimum section.		Contraction of area.	Remarks.
						Diameter.	Area.		
		Degrees Fahr.	*Pounds.*	*Pounds.*	*Per cent.*	*Inch.*	*Sq. inch.*	*Per cent.*	
1868	2–123	1580	.....	9,920	5.3	.728	.416	16.8	Time in making test, one hour and twenty minutes.
1875	3–782	1134	16,000	32,000	29.6	.565	.251	49.6	Time in making test, about one hour.
1876	3–782	1405	7,000	14,000	19.5	.580	.264	43.2	Do.
1877	3–782	1566	4,000	9,000	20.0	.500	.196	60.8	
1880	4–795	632	32,000	94,000	12.4	.740	.430	14.0	
1882	4–795	740	26,000	83,000	9.2	.720	.407	18.6	
1881	4–795	1052	26,000	45,300	3.5	.710	.396	20.8	
1880	4–795	1530	4,000	11,940	4.9	.767	.462	7.6	
1890	6–797	234	57,600	108,800	.....	.780	.478	4.4	
1891	6–797	373	57,200	111,600	.....	.785	.484	3.2	
1889	6–797	540	46,000	130,600	10.8	.749	.441	11.8	
1892	6–797	845	44,000	101,320	.....	.770	.466	6.8	
1894	6–797	971	40,000	84,120	5.3	.769	.464	7.2	
1895	6–797	1067	32,000	68,760	4.7	.768	.463	7.4	
1893	6–797	1221	28,000	48,500	3.3	.775	.472	5.6	
1896	6–797	1380	16,000	30,200	2.6	.780	.478	4.4	
1897	6–797	1592	.....	17,720	1.9	.761	.455	9.0	
1898	6–797	1634	.....	14,520	2.2	.590	.273	45.4	
1927	7–823	335	55,200	72,000	9.3	.7954	.497	0.6	
1930	7–823	413	52,000	90,000	2.0	.7910	.491	1.8	
1928	7–823	421	50,000	72,000	0.8	.7938	.497	0.6	
1931	7–823	624	44,000	90,000	2.4	.7898	.490	2.0	
1929	7–823	634	44,000	72,000	1.4	.7944	.496	0.8	
1969	10–334	478	60,000	120,000	2.0	.7916	.492	1.6	
1970	10–334	535	64,000	140,000	4.0	.7847	.484	3.2	Time in making test, about four hours.
1968	10–334	781	40,000	80,000	1.2	.796	.498	0.4	Time in making test, about three hours.
1963	10–334	1170	.....	40,600	3.9	.782	.480	4.0	Do.
1965	10–334	1262	.....	30,000	1.7	.7940	.495	1.0	Do.
1967	10–334	1362	.....	16,000	1.2	.791	.491	1.8	Time in making test, about three-fourths of an hour.
1966	10–334	1505	.....	10,000	2.4	.775	.472	5.6	Time in making test, about one and three-fourths hours.
1956	10–334	1689	.....	6,000	4.0	.768	.463	7.4	Time in making test, about three and one-half hours.
1964	10–334	1694	.....	6,000	2.4	.7873	.487	2.6	Time in making test, about one and three-fourths hours.
1910	Wrt. iron B.	412	26,000	36,000	2.0	.790	.490	2.0	
1909	...do	523	16,000	36,000	2.5	.790	.490	2.0	
1906	.. do	551	14,000	36,000	2.5	.789	.489	2.2	
1908	...do	659	14,000	44,000	5.0	.779	.477	4.6	
1905	.. do	662	14,000	36,000	3.0	.786	.485	3.0	
1901	...do	726	14,000	48,560	11.6	.700	.385	22.0	
1855	...do	743	14,000	44,700	11.6	.680	.363	27.4	

TEMPERATURE TESTS—Continued.

TABULATION OF BARS RUPTURED COLD, THAT HAD BEEN PREVIOUSLY STRAINED HOT.

No. of test.	Marks.	Time bar has rested.	Minimum sectional area.	Elastic limit.		Tensile strength.		Total elongation.		Total contraction of area.	Appearance of fracture.
				Per square inch on original area.	Per square inch on reduced area.	Per square inch on original area.	Per square inch on reduced area.	Under maximum load.	After rupture.		
		Hours.	*Sq. inch.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Per cent.*	*Per cent.*	*Per cent.*	
1868	2-123	1½	.416	36,600	43,990	53,720	64,570	.....	25.6	54.2	Silky.
1875	3-782	.....	.251	.....	.....	53,400	106,800	.....	33.0	63.8	Do.
1876	3-782	15	.264	33,000	62,500	46,320	87,730	23.4	25.8	69.6	Do.
1877	3-782	2	.196	23,400	59,690	33,760	86,120	.....	24.0	78.4	Do.
1780	4-795	20	.430	.....	.....	108,400	138,550	13.0	15.2	33.6	Fine granular, radiating from silky spot.
1882	4-795	16	.407	94,000	115,480	98,920	121,520	.....	16.6	39.6	Fine granular, radiating from silky center.
1881	4-795	18	.396	62,200	78,540	81,140	102,450	11.6	12.2	43.4	Fine granular, 70 per cent.; silky center, 30 per cent.
1880	4-795	20	.462	49,800	53,900	74,700	80,840	18.0	21.2	49.0	Silky.
1899	6-797	24	.478	112,000	117,150	120,000	125,520	10.0	11.6	18.6	Fine granular small dull spot.
1891	6-797	68	.484	118,200	122,110	123,100	127,170	9.6	10.0	19.6	Do.
1889	6-797	70	.441	.....	.....	149,780	169,820	.....	12.4	12.8	Fine granular.
1892	6-797	68	.466	123,800	132,830	124,400	133,480	.....	7.6	6.8	Do.
1894	6-797	48	.464	106,200	114,410	121,200	130,600	.....	9.8	9.2	Do.
1895	6-797	44	.463	88,000	95,030	117,120	126,480	11.4	12.2	23.0	Fine granular small dull spot at center.
1893	6-797	48	.472	76,000	80,510	115,160	121,990	12.4	13.4	23.0	Do.
1896	6-797	24	.478	61,000	66,950	109,480	114,520	11.2	12.0	27.4	Do.
1897	6-797	24	.455	52,000	57,140	96,920	106,510	11.6	11.0	29.4	Do.
1898	6-797	24	.278	.....	.....	59,960	109,820	.....	16.6	62.2	Granular, fine silky center.
1927	7-823	240	.497	80,000	80,480	116,320	117,020	.....	13.8	20.8	Granular.
1930	7-823	288	.491	101,800	103,670	119,360	121,550	9.5	13.2	18.6	Do.
1928	7-823	312	.497	82,400	82,900	118,740	119,460	11.6	13.2	20.8	Do.
1931	7-823	288	.490	106,000	108,160	122,200	124,690	10.0	11.6	20.8	Do.
1929	7-823	288	.496	89,160	89,720	119,400	120,360	11.0	13.2	20.8	Do.
1969	10-334	96	.492	138,800	141,060	158,520	161,100	7.4	7.0	9.2	Do.
1970	10-334	72	.481	164,400	169,830	167,400	172,930	6.8	6.4	9.2	Do.
1968	10-334	96	.498	110,000	110,440	155,040	155,660	7.7	7.6	9.2	Do.
1963	10-334	18	.480	91,600	95,420	147,600	153,750	.....	7.4	9.2	Granular; fractured in the head at root of thread.
1965	10-334	.....	.495	88,000	88,890	150,200	151,720	8.4	8.0	11.6	Granular.
1967	10-334	40	.491	72,000	73,320	136,400	138,900	6.5	6.4	16.2	Do.
1966	10-334	16	.479	59,000	62,500	118,120	125,130	7.2	7.6	23.0	Do.
1956	10-334	115	.462	52,400	56,590	102,100	110,260	14.2	14.0	27.4	Do.
1964	10-334	40	.487	60,000	61,600	114,360	117,410	11.0	12.0	23.0	Do.
[illegible]	Wrt from T	[illegible]	.490	41,400	42,240	51,070	52,090	18.8	27.0	50.8	Fibrous.
1909	....do	60	.490	44,000	44,900	52,600	53,670	15.8	25.0	49.0	Do.
1906	.... do	48	.489	43,600	44,580	52,440	53,620	17.4	20.0	47.2	Do.

1908	....do.....	65	.477	51,760	54,260	55,780	58,470	13.2	19.6	47.2	Do.
1905	....do.....	50	.485	45,400	46,800	52,620	54,250	17.4	26.0	49.0	Do.
1901	....do.....	120	.885	55,000	71,430	56,200	72,990	.....	19.4	45.4	Do.
1855	....do.....	1	.363	.....	.....	48,760	67,160	.....	29.0	52.4	Do.

TABULATION OF TENSILE TESTS OF WROUGHT-IRON BARS MARKED A.

No. of test.	Estimated temperature.	Elastic limit.		Tensile strength.			Load at rupture.		Elongation.		Contraction of area.	Appearance of fracture when cooled.	Color of stem when cooled.
		Per square inch.	Per cent. of cold bar.	Total.	Per square inch.	Per cent. of cold bar.	Total.	Per square inch.	Under maximum load.	After rupture.			
	Deg. Fahr.	*Pounds.*		*Pounds.*	*Pounds.*		*Pounds.*	*Pounds.*	*Per cent.*	*Per cent.*	*Per cent.*		
1912	70	45,000	100.0	30,590	61,180	100.0	28,400	83,040	7.6	9.8	31.6	Fibrous; trace of granulation	
1920	308	52,000	115.6	33,200	66,400	108.5	.....	.....	4.6	8.2	20.8	Fibrous	Straw.
1913	570	44,000	97.8	35,000	70,000	114.4	34,100	83,780	10.7	13.0	18.6	Fibrous, dark purple	Straw, purple hue.
1915	689	46,000	102.2	31,000	62,000	101.3	.....	.....	9.5	12.8	20.8	Fibrous, dark blue	Dark blue.
1916	889	36,000	80.0	26,000	52,000	84.9	23,700	61,560	8.2	15.8	23.0	Fibrous, blue black	Blue black.
1917	991	24,000	53.3	18,580	37,160	60.7	15,700	45,910	6.0	19.0	31.6	....do	Do.
1914	1161	14,000	31.1	10,420	20,840	34.1	10,200	31,680	5.8	19.4	35.6	....do	Do.
1918	1322	9,000	20.0	7,270	14,540	23.8	.....	.....	2.6	18.4	41.6	....do	Do.
1919	1568	.....	.....	3,180	6,420	10.5	.....	.....	1.9	12.0	32.9	Fibrous, spongy, blue black	Do.

TABULATION OF TENSILE TESTS OF BARS FROM MUCK-BAR AXLE NO. 5.

1825	195	26,800	.....	25,780	51,560	.....	23,700	81,160	13.6	17.2	41.6	Fibrous	
1826	379	24,000	.....	32,300	64,600	.....	30,800	87,250	15.2	17.0	29.4	....do	Mottled straw.
1824	565	16,060	.....	31,180	63,360	.....	29,200	80,440	17.8	20.8	27.4	Fibrous, dark purple	Light blue.
1827	813	14,000	.....	21,790	43,580	.....	14,000	49,470	12.0	27.6	43.4	Fibrous, blue black	Blue black.

TEMPERATURE TESTS—Continued.

TABULATION OF TENSILE TESTS OF WROUGHT-IRON BARS MARKED B.

No. of test.	Estimated temperature.	Elastic limit.		Tensile strength.			Load at rupture.		Elongation.		Contraction of area.	Appearance of fracture when cooled.	Color of stem when cooled.
		Per square inch.	Per cent. of cold bar.	Total.	Per square inch.	Per cent. of cold bar.	Total.	Per square inch.	Under maximum load.	After rupture.			
	Deg. Fahr.	*Pounds.*		*Pounds.*	*Pounds.*		*Pounds.*	*Pounds.*	*Per cent.*	*Per cent.*	*Per cent.*		
1900	70	30,560	100.0	23,570	47,140	100.0	19,100	83,410	26.4	34.0	54.2	Fibrous	
1911	179	28,400	92.9	23,600	47,200	100.1	.....	.....	20.8	24.6	47.2	....do	
1852	228	29,600	96.8	26,580	53,160	112.8	24,400	78,210	17.4	21.2	37.6	....do	
1850	256	28,000	91.6	24,800	49,600	105.2	22,800	84,160	11.7	17.6	41.6	....do	
1849	367	28,000	91.6	29,360	58,720	124.6	27,100	84,160	12.0	17.4	35.6	Fibrous, no change in color	Pale straw.
1851	476	14,000	45.8	29,580	59,160	125.5	26,100	83,650	14.4	21.6	37.6	Fibrous, bronze color	Bronze, mottled.
1856	592	14,000	45.8	29,260	58,520	124.1	25,300	83,770	16.0	23.4	39.6	Fibrous, dark bronze	Blue black.
1854	684	14,000	45.8	28,070	56,140	119.1	24,100	77,240	16.2	24.8	37.6	Fibrous, deep blue	Do.
1853	804	12,000	39.3	20,280	40,360	85.6	12,500	56,560	14.5	30.8	55.8	Fibrous, blue black	Bronze-black.
1907	915	12,000	39.3	10,100	38,200	81.0	11,700	55,190	13.3	29.8	57.6	Fibrous, dark blue	Dark blue.
1904	964	14,000	45.8	18,250	36,500	77.4	13,400	60,630	10.8	26.8	55.8	Fibrous, blue black	Blue black.
1857	1079	12,000	25.5	11,780	23,560	49.9	.....	.....	6.9	18.6	65.4	....do	Do.
1902	1201	.....	.....	8,390	16,780	35.6	.....	.....	9.2	44.0	72.2	....do	Do.
1903	1434	.....	.....	3,000	6,000	12.7	.....	.....	30.8	40.0	72.2	Fibrous, spongy, blue black	Do.
1858	1518	.....	.....	3,700	7,400	15.7	.....	.....	13.6	36.8	78.4	Fibrous, blue black	Do.

TEMPERATURE TESTS—Continued.

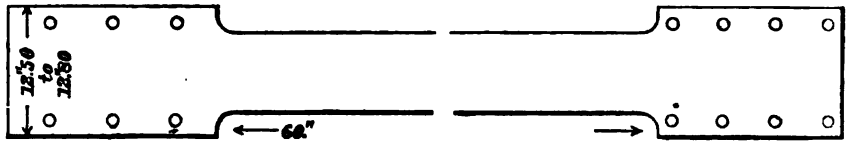
TABULATION OF TENSILE TESTS OF CAST (GUN) IRON BARS.

No. of Test	Estimated temperature.	Tensile strength.		Appearance of fracture when cooled.	Color of stem when cooled.	Remarks.
		Total.	Per square inch.			
	Deg. Fahr.	*Pounds.*	*Pounds.*			
1832	70	17,190	34,380	Uniform granular		
1833	70	13,280	26,560	Granular		Fractured at blow-hole.
1834	70	14,590	29,180	do		Do.
1835	70	14,030	28,060	Uniform granular		
1838	247	13,060	26,120	Uniform granular 5 per cent., faint straw color		
1848	275	16,070	32,140	Uniform granular		
1836	278	16,470	32,940	do	Straw, mottled	
1982	283	14,980	29,960	Granular	Faint straw	
1847	351	16,460	32,920	Uniform granular	Straw	
1829	477	14,990	29,980	Uniform granular, gray and straw color	Straw and yellowish	
1837	483	15,490	30,980	Uniform granular	Straw, purple tint	
1838	710	18,080	36,160	Uniform granular, very dark purple	Blue, black, mottled	
1830	716	17,080	34,160	do	Dark blue	
1843	845	17,190	34,380	Uniform granular, dark blue	do	
1844	893	18,089	36,160	Uniform granular, blue black	Blue black	
1831	963	16,760	33,520	do	do	
1839	986	15,770	31,540	Uniform granular		
1845	1098	10,020	20,040	Uniform granular, blue black	Blue black and brownish	
1842	1166	11,480	22,960	Uniform granular, dark blue	Dark blue	
1980	1255	11,220	22,440	Uniform granular, blue black	Blue black	
1840	1404	7,470	14,940	Uniform granular, black, blue tinge	Blue	
1841	1483	5,640	11,280	do	do	
1846	1615	4,370	8,740	Uniform granular, dark blue	do	
1981	1685	4,910	9,820	do	Dark blue	

TEMPERATURE TESTS OF WROUGHT-IRON AND STEEL PLATES.

Material from old columns previously tested by compression stress.
Plates from wrought-iron box column No. 359. Report 1884, page 35.

Form of specimens



No. 1713.

Sectional area, 8".10 × ".30 = 2.43 square inches.
Gauged length, 30".

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
2,430	1,000	0.	0.	Initial load.
12,150	5,000	.0053	.0000	
24,300	10,000	.0110	.0000	
36,450	15,000	.0163	0.	
48,600	20,000	.0217	0.	
60,750	25,000	.0271	0.	
63,180	26,000	.0282	.....	
65,610	27,000	.0292	.....	
68,040	28,000	.0304	.....	
70,470	29,000	.0316	.....	
72,900	30,000	.0330	.0001	
75,330	31,000	.0345	.....	
77,760	32,000	.0355	.....	
80,190	33,000	.0370	.....	
82,620	34,000	.0385	.....	
85,050	35,000	.0400	.0019	
87,480	36,000	.0420	.....	
89,910	37,000	.0435	.....	Elastic limit (not well defined).
92,340	38,000	.0457	.....	
94,770	39,000	.0480	.....	
97,200	40,000	.0508	.0070	
99,630	41,000	.0540	.....	
102,060	42,000	.0585	.....	
104,490	43,000	.0667	.....	
106,920	44,000	.1195	.....	
109,350	45,000	.26	.....	
111,780	46,000	.33	.....	
114,210	47,000	.46	.....	
116,640	48,000	.57	.....	
119,070	49,000	.75	.....	
121,500	50,000	.90	.....	
123,930	51,000	1.02	.....	
126,360	52,000	1.21	.....	
128,790	53,000	1.46	.....	
130,300	53,620	1.60	.....	Tensile strength.
0	0	1.52	.....	= 5.1 per cent.

Fractured 5".1 from neck. Appearance, granular, 60 per cent fibrous seamy, 40 per cent. The metal separated first at the fibrous section, beginning near the middle of the width of the plate.

Area at fracture, 8".01 × ".29 = 2.32 square inches. Contraction, per cent.

Elongation of 5-inch sections, ".23, ".27, ".24, ".26, ".27, ".27, ".23, ".22, ".22*, ".32.

No. 1714.

Sectional area, 8″.14 × ″.305 = 2.48 square inches.
Gauged length, 30″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
2,480	1,000	0.	0.	Initial load.
12,400	5,000	.0042	0.	
24,800	10,000	.0095	0.	
37,200	15,000	.0150	0.	
49,600	20,000	.0203	0.	
62,000	25,000	.0260	.0002	
74,400	30,000	.0320	.0005	
76,880	31,000	.0336	.....	
79,360	32,000	.0348	.....	
81,840	33,000	.0365	.....	
84,320	34,000	.0380	.....	Elastic limit.
86,800	35,000	.0400	.0024	
89,280	36,000	.0423	.....	
91,760	37,000	.0444	.....	
94,240	38,000	.0470	.....	
96,720	39,000	.0510	.....	
99,200	40,000	.0565	.0131	
101,680	41,000	.0620	.....	
104,160	42,000	.0955	.....	
106,640	43,000	.1550	.....	
109,120	44,000	.31	.....	
111,600	45,000	.45	.....	
114,080	46,000	.53	.....	
116,560	47,000	.65	.....	
119,040	48,000	.80	.....	
121,520	49,000	.98	.....	
124,000	50,000	1.15	.....	
126,480	51,000	1.40	.....	
128,960	52,000	1.70	.....	Tensile strength.
131,100	52,860	.....	.....	
0	0	1.96	.....	= 6.5 per cent.

Fractured 19″.5 from the neck. Appearance, granular, 70 per cent.; fibrous seams, 30 per cent.

Area at fracture, 8″.02 × ″.295 = 2.37 square inches. Contraction, 4.4 per cent.

Elongation of 5-inch sections, ″.19, ″.27, ″.28, ″.41*, ″.29, ″.31, ″.30, ″.31, ″.34, ″.31, ″.33, ″.28.

OBSERVATIONS ON HOT PLATE.

No. 1715.

From side plate C.

Sectional area, 8″.14 × ″.32 = 2.60 square inches.

Heated plate until the expansion in length of 30″ was ″.110. Estimated temperature being 618° Fahr., then applied stress of 52,000 pounds = 20,000 pounds per square inch and suddenly cooled a part of the plate—a spot at the middle of its width and length—by applying a piece of ice to the surface.

This sudden cooling increased the stress to 60,000 pounds = 23,080 pounds per square inch.

Again heated the plate till it was barely red in dim daylight, then applied stress of 20,000 pounds per square inch and suddenly cooled plate with ice as before.

This increased the stress to 65,000 pounds = 25,000 pounds per square inch.

Again brought up to barely red heat in twilight—it was red only in spots—and now tested by tension.

Ruptured under 137,200 pounds = 52,690 pounds per square inch.

While the plate was being strained the gas was shut off and the temperature consequently fell. About 5 minutes' time was occupied in producing rupture.

The metal exhibited the same kind of behavior previously observed in the test of hot bars, in respect to the periodical and sudden yielding under stresses between the elastic limit and tensile strength; when the yielding took place there being a temporary reduction in the stresses.

Fractured at neck. Appearance, fibrous.

Area at fracture, 8″.06 × ″.30 = 2.42 square inches. Contraction, 6.9 per cent.

Elongation after fracture, 2″.45 in 60″ = 4.1 per cent.

Elongation of 5-inch sections, ″.30*, ″.15, ″.17, ″.19, ″.22, ″.25, ″.23, ″.21, ″.18, ″.16, ″.18, ″.21.

No. 1716.

From side plate C.

Sectional area, 8″.14 × ″.318 = 2.59 square inches.
Gauged length, 30″.

Applied loads.		In gauged length.		Temperature.	Remarks.
Total.	Per square inch.	Elongation.	Set.		
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Deg. Fahr.*	
2,590	1,000	0.	0.	65	Initial load.
51,800	20,000	.0205			
2,590	1,000		0.		
51,800	20,000	.0205			E = 27,805,000.
2,590	1,000		0.		
Plate heated. Expansion ″.1460 in 30″. Estimated temperature, 806 Fahr.					
2,590	1,000	0.	0.	806	
51,800	20,000	.0228			
2,590	1,000		—.0035		
51,800	20,000	.0181			Mean difference, ″.02383 ∴ E = 24,038,000.
2,590	1,000		—.0078		
51,800	20,000	.0147			
2,590	1,000		—.0102		

While at the temperature of 806°, the plate was loaded with 51,800 pounds = 20,000 pounds per square inch tension, and then cooled by sprinkling the surface with water at temperature of 60°.

The contractile force exerted while cooling was 103,500 pounds = 39,960 pounds per square inch, and caused a permanent set of ″.0675 in 30″.

Applied loads.		In gauged length.		Temperature.	Remarks.
Total.	Per square inch.	Elongation.	Set.		
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Deg. Fahr.*	
2,590	1,000		.0675	70	
51,800	20,000	.0883			Mean difference, ″.0204 ∴ E substantially resumes its value when cold as before heating.
2,590	1,000		.0680		
51,800	20,000	.0882			
2,590	1,000		.0690		
Again heated. Expansion ″.1650 in 30″. 0675. Estimated temperature 889° Fahr. Loaded with					
51,800	20,000				and then cooled with sprinkler.
103,000	41,700				Contractile force exerted while cooling.

This caused an additional set of ″.10, a total of ″.1675.

No. 1716—Continued.

Third heat.

Expansion, ".1680 in 30".1675. Temperature, 901° Fahr.

Load of 81,700 pounds = 30,000 pounds per square inch applied, and then cooled with a sprinkler. Contractile force exerted while cooling, 112,000 pounds = 43,240 pounds per square inch.

Upon the application of water, the contractile force immediately advanced to 104,000 pounds, when there was apparently some yielding of the metal; from this load the contractile force slowly advanced to the maximum, the temperature of the plate in the mean time being below 200° Fahr.

This operation increased the set ".1770—a part of this set was caused by the stress 81,700 pounds applied with the testing machine before cooling was begun. The total set is now ".3445.

Fourth heat.

Expansion, ".1620 in 30".3445. Temperature, 867° Fahr.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
81,700	30,000	.....	.....	Load applied and then cooled, first using water then snow.
115,000	44,400	.....	.....	Contractile force exerted while cooling.
		This operation increased the set ".1413. The total set is now ".4858. Loaded now to determine the modulus of elasticity.		
2,590	1,000	0.	0.	
51,800	20,000	.0212	.....	Mean difference ".0209 ∴ the modulus of elasticity remains substantially unchanged.
2,590	1,000	.....	.0005	
51,800	20,000	.0214	.....	
2,590	2,590	.....	.0004	

Fifth heat.

Expansion, ".1530 in 30".4858. Temperature, 819° Fahr.

Load of 100,000 pounds = 38,610 pounds per square inch applied, and then cooled with snow, commencing at the ends and cooling towards the middle of the length.

Contractile force exerted while cooling, 116,000 pounds = 44,790 pounds per square inch.

Set increased ".1340. Total set now ".6198.

Tensile strength, 136,900 pounds = 52,857 pounds per square inch.

Fractured cold, location of fracture at the neck. Appearance, fibrous.

Elongation after fracture, 3".92 in 60" = 6.5 per cent.

Elongation of 5-inch sections: ".26, ".31, ".31, ".31, ".36, ".33, ".29, ".27, ".41, ".34, ".42.

No. 1717.

From side plate D.

Sectional area, 8″.12×.298=2.42 square inches.
Tested hot, at temperature estimated abut 970° to 1020° Fahr.
Tensile strength, 79,200 pounds=32,730 pounds per square inch.
Fractured at middle of stem. The heated section was 30″ long at the middle of the stem.
Appearance of fracture, fibrous.
Area at fracture, 7″.91×″.28=2.21 square inches.
Contraction, 8.7 per cent.
Elongation of 5-inch sections: ″.00, ″.00, ″.00, ″.02, ″.26, ″.34*, ″.28, ″.05, ″.03, ″.00, ″.00, ″.00.

No. 1718.

From side plate C.

Sectional area, 8″.14×″.318=2.59 square inches.
Tested hot. Expansion, ″.237 in 30″. Temperature, 1229° Fahr.
Rapid elongation began at 41,000 pounds=15,830 pounds per square inch.
Tensile strength, 45,100 pounds=17.410 pounds per square inch.
Fractured 5″ from middle of stem. Appearance, fibrous, lamellar. Separated first at the middle of the width of the sheet.
Area at fracture, 7″.75×″.27=2.09 square inches.
Contraction, 19.3 per cent.
Elongation of 5-inch sections: ″.00, ″.00, ″.05, ″.03, ″.47*, ″.16, ″.28, ″.08, ″.07, ″.00, ″.00, ″.00.

Steel plate from steel latticed column.
The metal had been loaded with 25,360 pounds per square inch in the test of the latticed column.
Assumed co-efficient of expansion, .0000066.

No. 1719.

Sectional area, 7″.07×″.388=2.74 square inches.
Tested hot. Expansion, ″.2360 in 30″. Temperature, 1262° Fahr.
Rapid stretching at 70,000 pounds=25,550 pounds per square inch.
Tensile strength, 83,700 pounds=30,550 pounds per square inch.
Fractured 2″ from middle of stem. Tore apart from one edge.
Appearance of fracture, silky.
Area at fracture, 5″.75×″.12=.690 square inch.
Contraction, 74.8 per cent.
Elongation of 5-inch sections: ″.00, ″.00, ″.00, ″.04, ″.26, 2″.00*, ″.74, ″.05, ″.02, ″.06, ″.00, ″.00.

Steel plate from same column as No. 1719.

No. 1720.

Sectional area, 7″.10, × ″.386 = 2.74 square inches.
Gauged length, 30″.
Tested hot.

Applied loads.		In gauged lengths.		Temperature.	Remarks.
Total.	Per square inch.	Elongation.	Set.		
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Deg. Fahr.*	
2,740	1,000	0.	0.	70	Initial load.
68,500	25,000	.0251	.....	.....	
2,740	1,000	.....	−.0001	.....	
68,500	25,000	.0250	.....	.....	E = 28,900,000.
2,740	1,000	.....	+.0001	.....	
68,500	25,000	.0250	.....	.....	
2,740	1,000	.....	.0001	.....	
	Heated.	Expansion, ″.1929 in 30″.		Temperature, 1039° Fahr.	
2,740	1,000	0.	0.	969	
68,500	25,000	.0438	.....	.....	Elastic limit passed by this load.
2,740	1,000	.....	.0140	.....	
144,000	52,550	.....	.....	.....	Tensile strength.

Fractured 1″ from middle of stem. Separated first at the middle of the width.
Appearance of fracture, silky.
Area at fracture, 5″.75 × ″.16 = .92 square inch.
Contraction, 66.4 per cent.
Elongation of 5-inch sections, ″.04, ″.03, ″.07, ″.11, ″.12, ″,48, 1″.90, ″.18, ″.12, ″.11, ″.06, ″.06.

Steel plate from same column as No. 1719.

No. 1721.

Sectional area, 7″.13×″.388=2.77 square inches.
Gauged length, 30″.

Applied loads.		In gauged length.		Temperature.	Remarks.
Total.	Per square inch.	Elongation.	Set.		
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Deg. Fahr.*	
2,770	1,000	0.	0.	70	Initial load.
55,400	20,000	.0203	.....	.....	E=28,360,000.
2,770	1,000	.....	.0001	.....	
55,400	20,000	.0201	.....	.....	
2,770	1,000	.....	.0001	.....	
55,400	20,000	.0202	.....	.....	
2,770	1,000	.....	.0001	.....	
Heated. Expansion, ″.1320 in 30″. Temperature, 737° Fahr.					
2,770	1,000	0.	0.	667	Mean differences, ″.0228 . ·. E=25,580,000.
55,400	20,000	.0199	.....	.....	
2,770	1,000	.....	—.0046	.....	
55,400	20,000	.0162	.....	.....	
2,770	1,000	.....	—.0083	.....	
55,400	20,000	.0123	.....	.....	
2,770	1,000	.....	—.0112	.....	
Again heated to about 700° Fahr.					
95,000	34,300	.....	.....		Rapid stretching.
218,000	78,700	.....	.....		Tensile strength.
198,000	.....	.....	.....		Load at time of rupture.

Fractured 2″ from middle of stem; appearance, silky.
Area at fracture, 6″.10×″.32=1.952 square inches.
Contraction, 29.5 per cent.
Elongation of 5-inch sections, ″.23, ″.23, ″.25, ″.32, ″.30, ″.42, 1″.61*, ″.48, ″.34, ″.31, ″.23, ″.15.

Steel plate from same column as No. 1719.

No. 1722.

Sectional area, 7″.12×″.386=2.75 square inches.
Gauged length, 30″.
Temperature, 70° Fahr.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
2,750	1,000	0.	0.	
13,750	5,000	.0047	0.	
27,500	10,000	.0102	0.	
41,250	15,000	.0153	0.	
55,000	20,000	.0205	0.	E=29,032,000.
68,750	25,000	.0256	0.	
82,500	30,000	.0307	0.	
96,250	35,000	.0358	.0001	
110,000	40,000	.0412	.....	
112,750	41,000	.0424	.....	
115,500	42,000	.0434	.....	
118,250	43,000	.0444	.....	
121,000	44,000	.0455	.....	
123,750	45,000	.0465	.....	
126,500	46,000	.0477	.....	
129,250	47,000	.0487	.....	
132,000	48,000	.0498	.....	
134,750	49,000	.0508	.....	
137,500	50,000	.0522	.0012	Elastic limit.
140,250	51,000	.0555	.....	
		.56	.....	
143,000	52,000	.58	.....	
145,750	53,000	.61	.....	
148,500	54,000	.66	.....	
151,250	55,000	.72	.....	
154,000	56,000	.76	.....	
156,750	57,000	.82	.....	
159,500	58,000	.87	.....	
162,250	59,000	.93	.....	
165,000	60,000	1.01	.....	
170,500	62,000	1.14	.....	
176,000	64,000	1.34	.....	
181,500	66,000	1.53	.....	
187,000	68,000	1.70	.....	
192,500	70,000	2.00	.....	
198,000	72,000	2.35	.....	
203,500	74,000	2.63	.....	
209,000	76,000	2.70	.....	
211,200	76,800	5.05	.....	Tensile strength.
195,000	.....	.....	.....	Load at time of rupture.

Fractured 1″ from middle of stem. Appearance, silky.
Area at fracture, 5″.97×″.25=1.49 square inch. Contraction, 45.8 per cent.
Elongation of 5-inch sections, ″.45, 70″., ″.81, ″.81, ″.78, 1″.04, 2″.00*, ″.91, ″.74, ″.67, ″.67, ″.57.

WROUGHT IRON BARS.

TENSILE TESTS OF COMMON ROUND BARS IN THE CONDITION THEY CAME FROM THE ROLLS.

No. 2031.

First 2-inch bar.

Mark, A.
Diameter, 2″.02.
Sectional area, 3.20 square inches.
Gauged length, 20″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
3,200	1,000	0.	0.	Initial load.
16,000	5,000	.0026	0.	
32,000	10,000	.0069	0.	
48,000	15,000	.0094	— .0002	
64,000	20,000	.0123	— .0006	
67,200	21,000	.0135	.....	
70,400	22,000	.0143	.....	
73,600	23,000	.0153	.....	
76,800	24,000	.0160	.....	
80,000	25,000	.0171	+ .0002	Elastic limit.
83,200	26,000	.0180	.....	
86,400	27,000	.0212	.....	
89,600	28,000	.0900	.....	
92,800	29,000	.12	.....	
96,000	30,000	.16	.....	
99,200	31,000	.21	.....	
102,400	32,000	.26	.....	
105,600	33,000	.31	.....	
108,800	34,000	.36	.....	
112,000	35,000	.44	.....	
115,200	36,000	.52	.....	
118,400	37,000	.60	.....	
121,600	38,000	.70	.....	
124,800	39,000	.77	.....	
128,000	40,000	.87	.....	
131,200	41,000	1.02	.....	
134,400	42,000	1.20	.....	
137,600	43,000	1.33	.....	
140,800	44,000	1.50	.....	
144,000	45,000	1.70	.....	
147,200	46,000	2.06	.....	
150,400	47,000	2.48	.....	
153,600	48,000	3.22	.....	
154,100	48,160	.....	.....	Tensile strength.
0	0	3.62	.....	=18.2 per cent.

Fractured 7″.8 from face of holder jaws. Appearance, fibrous; trace of granulation.

Diameter at fracture, 1″.70. Area, 2.27 square inches. Contraction, 29.1 per cent.

Elongation of 5-inch sections, 1″.68*, ″.90, ″.97, ″.90, ″.86, ″.86.

No. 2032.

First 2-inch bar.

Mark, B.
Diameter, 2″.02.
Sectional area, 3.20 square inches.
Gauged length, 20″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
3,200	1,000	0.	0.	Initial load.
16,000	5,000	.0030	.....	
32,000	10,000	.0067	.....	
48,000	15,000	.0106	.0002	
64,000	20,000	.0149	.0010	
67,200	21,000	.0160	.....	
70,400	22,000	.0170	.....	
73,600	23,000	.0180	.....	Elastic limit.
76,800	24,000	.0198	.....	
80,000	25,000	.0225	.....	
83,200	26,000	.0253	.....	
86,400	27,000	.0430	.....	
89,600	28,000	.1450	.....	
92,800	29,000	.18	.....	
96,000	30,000	.24	.....	
Bar rested 39 hours, unloaded.				
96,000	30,000	.24	.....	
99,200	31,000	.24	.....	
102,400	32,000	.24	.....	
105,600	33,000	.24	.....	
108,800	34,000	.45	.....	
112,000	35,000	.51	.....	
115,200	36,000	.56	.....	
118,400	37,000	.67	.....	
121,600	38,000	.76	.....	
124,800	39,000	.84	.....	
128,000	40,000	.97	.....	
131,200	41,000	1.12	.....	
134,400	42,000	1.26	.....	
137,600	43,000	1.47	.....	
140,800	44,000	1.72	.....	
143,100	44,720	.....	.....	Tensile strength.
0	0	1.83	.....	=9.1 per cent.

Fractured 8″.5 from face of holder jaws. Appearance, fibrous; trace of granulation.

Diameter at fracture, 1″.69. Area, 2.24 square inches. Contraction, 30 per cent.

Elongation of 5-inch sections, ″.77*, ″.43, ″.50, ″.46, ″.43, ″.42.

No. 2033.

First 2-inch bar.

Mark, C.
Diameter, 2″.02.
Sectional area, 3.20 square inch.
Gauged length, 20″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
3,200	1,000	0.	0.	Initial load.
16,000	5,000	.0029	.....	
32,000	10,000	.0066	.....	
48,000	15,000	.0100	0.	
64,000	20,000	.0135	.....	
67,200	21,000	.0142	.....	
70,400	22,000	.0149	.....	
73,600	23,000	.0158	.....	
76,800	24,000	.0168	.....	
80,000	25,000	.0177	.....	Elastic limit.
83,200	26,000	.0191	.....	
86,400	27,000	.0233	.....	
89,600	28,000	.1000	.....	
92,800	29,000	.20	.....	
96,000	30,000	.23	.....	
99,200	31,000	.26	.....	
102,400	32,000	.32	.....	
105,600	33,000	.37	.....	
108,800	34,000	.44	.....	
112,000	35,000	.53	.....	
115,200	36,000	.60	.....	
118,400	37,000	.67	.....	
121,600	38,000	.77	.....	
124,800	39,000	.87	.....	
128,000	40,000	1.00	.....	
131,200	41,000	1.15	.....	
134,400	42,000	1.37	.....	
137,600	43,000	1.55	.....	
140,800	44,000	1.71	.....	
144,000	45,000	2.00	.....	
147,200	46,000	2.47	.....	
147,800	46,190	.....	.....	Tensile strength.
0	0	2.78	.....	=13.9 per cent.

Fractured 20½″ from grips. Appearance, fibrous.
Diameter at fracture, ″1.79. Area, 2.52 square inches. Contraction, 21.2 per cent.
Elongation of 5-inch sections, ″.60, ″.63, ″.63, ″.91*, ″.61, ″.61.

No. 2034.

Second 2-inch bar.

Marks, A.
Diameter, ″2.02.
Sectional area, 3.20 square inches.
Gauged length, 20″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
3,200	1,000	0.	0.	Initial load.
16,000	5,000	.0033	.....	
32,000	10,000	.0070	.....	
48,000	15,000	.0107	.0003	
64,000	20,000	.0145	.....	
67,200	21,000	.0153	.....	
70,400	22,000	.0163	.....	
73,600	23,000	.0171	.....	
76,800	24,000	.0183	.....	
80,000	25,000	.0199	.....	
83,200	26,000	.0203	.....	Elastic limit.
86,400	27,000	.0217	.....	
89,600	28,000	.0256	.....	
92,800	29,000	.0460	.....	
96,000	30,000	.15	.....	
99,200	31,000	.21	.....	
102,400	32,000	.24	.....	
105,600	33,000	.29	.....	
108,800	34,000	.35	.....	
112,000	35,000	.41	.....	
115,200	36,000	.48	.....	
118,400	37,000	.56	.....	
121,600	38,000	.66	.....	
124,800	39,000	.75	.....	
128,000	40,000	.85	.....	
131,200	41,000	.96	.....	
134,400	42,000	1.12	.....	
137,600	43,000	1.31	.....	
140,800	44,000	1.52	.....	
144,000	45,000	1.76	.....	
147,200	46,000	2.06	.....	
149,400	46,690	.....	.....	Tensile strength.
0	0	2.26	.....	=11.3 per cent.

Fractured 1″ from face of grips. Appearance, fibrous.
Diameter at fracture, 1″.79. Area, 2.52 square inches. Contraction, 21.2 per cent.
Elongation of 5-inch sections, ″.57, ″.56, ″.57, ″.54, ″.59, ″.57.

No. 2035.

Second 2-inch bar.

Mark, B.
Diameter, 2″.02.
Sectional area, 3.20 square inches.
Gauged length, 20″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
8, 200	1, 000	0.	0.	Initial load.
16, 000	5, 000	.0025	.....	
32, 000	10, 000	.0072	.....	
48, 000	15, 000	.0108	.0086	
64, 000	20, 000	.0145	.0111	
67, 200	21, 000	.0158	.....	
70, 400	22, 000	.0166	.....	
73, 600	23, 000	.0175	.....	
76, 800	24, 000	.0186	.....	
80, 000	25, 000	.0196	.....	
83, 200	26, 000	.0210	.....	Elastic limit.
86, 400	27, 000	.0227	.....	
89, 600	28, 000	.0243	.....	
92, 800	29, 000	.0272	.....	
96, 000	30, 000	.0900	.....	
99, 200	31, 000	.15	.....	
102, 400	32, 000	.18	.....	
105, 600	33, 000	.24	.....	
108, 800	34, 000	.29	.....	
112, 000	35, 000	.34	.....	
115, 200	36, 000	.41	.....	
118, 400	37, 000	.49	.....	
121, 600	38, 000	.56	.....	
124, 800	39, 000	.65	.....	
128, 000	40, 000	.73	.....	
131, 200	41, 000	.84	.....	
134, 400	42, 000	.96	.....	
137, 600	43, 000	1.10	.....	
140, 800	44, 000	1.25	.....	
144, 000	45, 000	1.40	.....	
147, 200	46, 000	1.65	.....	
150, 400	47, 000	1.90	.....	
153, 600	48, 000	2.28	.....	
156, 340	48, 860	2.75	.....	
156, 800	49, 000	2.93	.....	
158, 100	49, 410	3.22	.....	
159, 620	49, 880	.....	.....	Tensile strength.
0	0	4.11	.....	=20.5 per cent.

Fractured 18″ from grips. Appearance, fibrous, 90 per cent.; granular, 10 per cent.

Diameter at fracture, 1″.70. Area, 2.27 square inches. Contraction, 29.1 per cent.

Elongation of 5-inch sections, ″.97, ″.92, ″.95, 1″.28*, ″.96, 1″.01.

No. 2036.

Second 2-inch bar.

Mark, C.
Diameter, 2″.02.
Sectional area, 3.20 square inches.
Gauged length, 20″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
3,200	1,000	0.	0.	Initial load.
16,000	5,000	.0031	.....	
32,000	10,000	.0063	.....	
48,000	15,000	.0105	.....	
64,000	20,000	.0140	.....	
67,200	21,000	.0148	.....	
70,400	22,000	.0157	.....	
73,600	23,000	.0165	.....	
76,800	24,000	.0174	.....	
80,000	25,000	.0183	.....	Elastic limit.
83,200	26,000	.0197	.....	
86,400	27,000	.0211	.....	
89,600	28,000	.0248	.....	
92,800	29,000	.0800	.....	
96,000	30,000	.16	.....	
99,200	31,000	.21	.....	
102,400	32,000	.24	.....	
105,600	33,000	.29	.....	
108,800	34,000	.34	.....	
112,000	35,000	.42	.....	
115,200	36,000	.49	.....	
118,400	37,000	.57	.....	
121,600	38,000	.65	.....	
124,800	39,000	.75	.....	
128,000	40,000	.87	.....	
131,200	41,000	.97	.....	
134,400	42,000	1.12	.....	
137,600	43,000	1.24	.....	
140,800	44,000	1.42	.....	
144,000	45,000	1.75	.....	
147,200	46,000	1.99	.....	
150,400	47,000	2.38	.....	
151,000	47,190	.....	.....	Tensile strength.
0	0	2.40	.....	=12.0 per cent.

Fractured 2″ from grips. Appearance, fibrous.
Diameter at fracture, 1″.87. Area, 2.75 square inches. Contraction, 14.1 per cent.
Elongation of 5-inch sections, ″.56, ″.62, ″.65, ″.57, ″.56, ″.47.

No. 2037.

Second 1½-inch bar.

Mark, A.
Diameter, 1″.52.
Sectional area, 1.815 square inches.
Gauged length, 20″.
NOTE.—The first 1½″ bar was used for material for endurance tests.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,815	1,000	0.	0.	Initial load.
9,075	5,000	.0030	.....	
18,150	10,000	.0067	.....	
27,225	15,000	.0103	.0002	
36,300	20,000	.0142	.0002	
38,115	21,000	.0150	.....	
39,930	22,000	.0158	.....	
41,745	23,000	.0166	.....	
43,560	24,000	.0173	.....	
45,375	25,000	.0180	.....	
47,190	26,000	.0190	.....	
49,005	27,000	.0200	.....	
50,820	28,000	.0210	.....	
52,635	29,000	.0221	.....	
54,450	30,000	.0234	.0024	Elastic limit.
56,265	31,000	.0258	.....	
58,080	32,000	.0277	.....	
59,895	33,000	.25	.....	
61,710	34,000	.30	.....	
63,525	35,000	.35	.....	
65,340	36,000	.43	.....	
67,155	37,000	.50	.....	
68,970	38,000	.57	.....	
70,785	39,000	.67	.....	
72,600	40,000	.75	.....	
74,415	41,000	.85	.....	
76,230	42,000	1.00	.....	
78,045	43,000	1.14	.....	
79,860	44,000	1.28	.....	
81,675	45,000	1.47	.....	
83,490	46,000	1.64	.....	
85,305	47,000	2.00	.....	
87,120	48,000	2.49	.....	
88,935	49,000	3.45	.....	
89,150	49,120	3.87	.....	Tensile strength.
0	0	3.85	.....	=19.3 per cent.

Fractured 22½″ from face of grips. Appearance, fibrous trace of granulation.

Diameter at fracture, 1″.31. Area, 1.35 square inches. Contraction, 25.6 per cent.

Elongation of 5-inch sections, ″.96, ″.97, 1″.07*, ″.94, ″.87, .″88.

No. 2038.

Second 1½-inch bar.

Mark, B.
Diameter, 1″.52.
Sectional area, 1.815 square inches.
Gauged length, 20″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,815	1,000	0.	0.	Initial load.
9,075	5,000	.0030	.....	
18,150	10,000	.0065	.....	
27,225	15,000	.0100	.....	
36,300	20,000	.0136	.0002	
38,115	21,000	.0143	.....	
39,930	22,000	.0151	.....	
41,745	23,000	.0159	.....	
43,560	24,000	.0167	.....	
45,375	25,000	.0174	.....	
47,190	26,000	.0183	.....	
49,005	27,000	.0191	.....	
50,820	28,000	.0200	.....	
52,635	29,000	.0209	.....	
54,450	30,000	.0219	.0013	Elastic limit.
56,265	31,000	.0235	.....	
58,080	32,000	.0249	.....	
59,895	33,000	.0550	.....	
61,710	34,000	.28	.....	
63,525	35,000	.34	.....	
65,340	36,000	.41	.....	
67,155	37,000	.46	.....	
68,970	38,000	.53	.....	
70,785	39,000	.60	.....	
72,600	40,000	.72	.....	
74,415	41,000	.82	.....	
76,230	42,000	.94	.....	
78,045	43,000	1.05	.....	
79,860	44,000	1.17	.....	
81,675	45,000	1.40	.....	
83,490	46,000	1.63	.....	
85,305	47,000	1.89	.....	
87,120	48,000	2.25	.....	
88,935	49,000	2.83	.....	
89,940	49,550	4.00	.....	Tensile strength.
0	0	4.79	.....	=23.9 per cent.

Fractured 24″ from grips. Appearance, fibrous.
Diameter at fracture, 1″.27. Area, 1.27 square inches. Contraction, 30.0 per cent.
Elongation of 5-inch sections, 1″.10, 1″.17, 1″.42[a], 1″.20, 1″.00, 1″.07.

No. 2039.

Second 1½-inch bar.

Mark, C.
Diameter, 1″.52.
Sectional area, 1.815 square inches.
Gauged length, 20″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,815	1,000	0.	0.	Initial load.
9,075	5,000	.0027	.....	
18,150	10,000	.0062	.....	
27,225	15,000	.0099	.....	
36,300	20,000	.0135	0.	
38,115	21,000	.0143	.....	
39,930	22,000	.0152	.....	
41,745	23,000	.0158	.....	
43,560	24,000	.0165	.....	
45,375	25,000	.0172	.....	
47,190	26,000	.0180	.....	
49,005	27,000	.0190	.....	
50,820	28,000	.0198	.....	
52,635	29,000	.0209	.....	
54,450	30,000	.0219	.....	
56,265	31,000	.0233	.....	
58,080	32,000	.0244	.....	Elastic limit.
59,895	33,000	.0262	.....	
61,710	34,000	.20	.....	
63,525	35,000	.33	.....	
65,340	36,000	.39	.....	
67,155	37,000	.44	.....	
68,970	38,000	.51	.....	
70,785	39,000	.58	.....	
72,600	40,000	.67	.....	
74,415	41,000	.77	.....	
76,230	42,000	.87	.....	
78,045	43,000	1.00	.....	
79,860	44,000	1.12	.....	
81,675	45,000	1.30	.....	
83,490	46,000	1.50	.....	
85,305	47,000	1.80	.....	
87,120	48,000	2.11	.....	
88,935	49,000	2.58	.....	
90,750	50,000	3.32	.....	
91,300	50,300	.....	.....	Tensile strength.
0	0	4.80	.....	= 24.0 per cent.

Fractured 19″ from the grips. Appearance, fibrous; trace of granulation.

Diameter at fracture, 1″.27. Area, 1.27 square inches. Contraction, 30 per cent.

Elongation of 5-inch sections, ″.94, 1″.13, 1″.55*, 1″.07, 1″.05, ″.98.

No. 2040.

First 1-*inch bar.*

Mark, A.
Diameter, 1″.01.
Sectional area, .801 square inch.
Gauged length, 20″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
801	1,000	0.	0.	Initial load.
4,005	5,000	.0029	.....	
8,010	10,000	.0060	.....	
12,015	15,000	.0095	.....	
16,020	20,000	.0129	0.	
20,025	25,000	.0162	.....	
24,030	30,000	.0202	.0002	
24,831	31,000	.0210	.....	
25,632	32,000	.0217	.....	
26,433	33,000	.0225	.....	
27,234	34,000	.0235	.....	
28,035	35,000	.0247	.....	
28,836	36,000	.0259	.....	Elastic limit.
29,637	37,000	.0279	.....	
30,438	38,000	.0315	.....	
31,239	39,000	.0950	.....	
32,040	40,000	.18	.....	
32,841	41,000	.21	.....	
33,642	42,000	.26	.....	
34,443	43,000	.33	.....	
35,244	44,000	.40	.....	
36,045	45,000	.45	.....	
36,846	46,000	.54	.....	
37,647	47,000	.65	.....	
38,448	48,000	.73	.....	
39,249	49,000	.85	.....	
40,050	50,000	.93	.....	
40,851	51,000	1.04	.....	
41,652	52,000	.....	.....	Tensile strength.
0	0	1.15	.....	=5.8 per cent.

Fractured in grips. Appearance, fibrous, 60 per cent.; granular, 40 per cent.

Diameter at fracture, ″.93. Area, .679 square inch. Contraction, 15.2 per cent.

Elongation of 5-inch sections, ″.28, ″.28, ″.28, ″.30, ″.29, ″.30.

No. 2041.

First 1-inch bar.

Mark, B.
Diameter, 1″.01.
Sectional area, .801 square inch.
Gauged length, 20″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
801	1,000	0.	0.	Initial load.
4,005	5,000	.0030	.....	
8,010	10,000	.0067	.....	
12,015	15,000	.0106	.....	
16,020	20,000	.0142	.....	
20,025	25,000	.0180	0.	
24,030	30,000	.0220	.0005	
24,831	31,000	.0231	.....	
25,632	32,000	.0240	.....	
26,433	33,000	.0250	.....	
27,234	34,000	.0258	.....	
28,035	35,000	.0269	.....	
28,836	36,000	.0279	.....	
29,637	37,000	.0292	.....	
30,438	38,000	.0301	.....	Elastic limit.
31,239	39,000	.0327	.....	
32,040	40,000	.0360	.....	
32,841	41,000	.0975	.....	
33,642	42,000	.17	.....	
34,443	43,000	.19	.....	
35,244	44,000	.23	.....	
36,045	45,000	.28	.....	
36,846	46,000	.35	.....	
37,647	47,000	.45	.....	
38,448	48,000	.52	.....	
39,249	49,000	.60	.....	
40,050	50,000	.70	.....	
40,851	51,000	.84	.....	
41,652	52,000	.94	.....	
42,453	53,000	1.07	.....	
43,254	54,000	1.24	.....	
44,055	55,000	1.38	.....	
44,856	56,000	1.48	.....	
45,440	56,730	.....	.....	Tensile strength.
0	0	1.58	.....	= 7.9 per cent.

Fractured 17½″ from grips. Appearance, fibrous, 90 per cent.; granular in spots, 10 per cent.

Diameter at fracture, ″.94. Area, .694 square inch. Contraction, 13.4 per cent.

Elongation of 5-inch sections, ″.36, ″.38, ″.45*, ″.38, ″.37, ″,39.

No. 2042.

First 1-inch bar.

Mark, C.
Diameter, 1″.01.
Sectional area, .801 square inch.
Gauged length, 20″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
801	1,000	0.	0.	Initial load.
4,005	5,000	.0027	.....	
8,010	10,000	.0062	.....	
12,015	15,000	.0097	.....	
16,020	20,000	.0134	.....	
20,025	25,000	.0169	.....	
24,030	30,000	.0208	.....	
24,831	31,000	.0218	.....	
25,632	32,000	.0228	.....	
26,433	33,000	.0234	.....	
27,234	34,000	.0244	.....	
28,035	35,000	.0257	.....	
28,836	36,000	.0268	.....	Elastic limit.
29,637	37,000	.0285	.....	
30,438	38,000	.0317	.....	
31,239	39,000	.0360	.....	
32,040	40,000	.15	.....	
32,841	41,000	.17	.....	
33,642	42,000	.21	.....	
34,443	43,000	.27	.....	
35,244	44,000	.32	.....	
36,045	45,000	.40	.....	
36,846	46,000	.49	.....	
37,647	47,000	.60	.....	
38,448	48,000	.70	.....	
39,180	48,910	.....	.....	Tensile strength.
0	0	.77	.....	= 8.9 per cent.

Fractured 9″ from grips. Appearance, fibrous, 80 per cent.; granular, 20 per cent.

Diameter at fracture, ″.96. Area, .724 square inch. Contraction, 9.6 per cent.

Elongation of 5-inch sections, ″.23*, ″.25*, ″.17, ″.18, ″.17, ″.19.

No. 2043.

Second 1-*inch bar.*

Mark, A.
Diameter, 1″.01.
Sectional area, .801 square inch.
Gauged length, 20″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
801	1,000	0.	0.	Initial load.
4,005	5,000	.0030	.....	
8,010	10,000	.0070	.....	
12,015	15,000	.0109	.....	
16,020	20,000	.0148	.....	
20,025	25,000	.0187	.....	
24,030	30,000	.0237	.0015	
24,831	31,000	.0249	.....	
25,632	32,000	.0261	.....	Elastic limit.
26,433	33,000	.0278	.....	
27,234	34,000	.0300	.....	
28,035	35,000	.0335	.....	
28,836	36,000	.0450	.....	
29,637	37,000	.14	.....	
30,438	38,000	.18	.....	
31,239	39,000	.22	.....	
32,040	40,000	.29	.....	
32,841	41,000	.36	.....	
33,642	42,000	.43	.....	
34,443	43,000	.50	.....	
35,244	44,000	.59	.....	
36,045	45,000	.69	.....	
36,846	46,000	.77	.....	
37,647	47,000	.88	.....	
38,448	48,000	1.01	.....	
39,249	49,000	1.18	.....	
40,050	50,000	1.30	.....	
40,851	51,000	1.49	.....	
41,652	52,000	1.68	.....	
42,453	53,000	1.84	.....	
43,254	54,000	2.20	.....	
44,055	55,000	2.60	.....	
44,856	56,000	2.35	.....	
44,980	56,150	.....	.....	Tensile strength.
0	0	2.58	.....	=17.7 per cent.

Fractured 18″ from grips. Appearance, fibrous, 85 per cent.; granular in spots.

Diameter at fracture, ″.88. Area, .608 square inch. Contraction, 24.1 per cent.

Elongation of 5-inch sections, ″.80, ″.83, ″.83, ″.99*, ″.88, ″.83.

No. 2044.

Second 1-inch bar.

Mark, B.
Diameter, 1″.01.
Sectional area, .801 square inch.
Gauged length, 20″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
801	1,000	0.	0.	Initial load.
4,005	5,000	.0030	.....	
8,010	10,000	.0071	.....	
12,015	15,000	.0108	.....	
16,020	20,000	.0148	.....	
20,025	25,000	.0188	.....	
24,030	30,000	.0238	.0006	
24,831	31,000	.0245	.....	
25,632	32,000	.0255	.....	
26,433	33,000	.0265	.....	Elastic limit.
27,234	34,000	.0281	.....	
28,035	35,000	.0301	.....	
28,836	36,000	.0342	.....	
29,637	37,000	.10	.....	
30,438	38,000	.18	.....	
31,239	39,000	.23	.....	
32,040	40,000	.28	.....	
32,841	41,000	.34	.....	
33,642	42,000	.43	.....	
34,443	43,000	.50	.....	
35,244	44,000	.58	.....	
36,045	45,000	.67	.....	
36,846	46,000	.77	.....	
37,647	47,000	.87	.....	
38,448	48,000	.99	.....	
39,249	49,000	1.10	.....	
40,050	50,000	1.24	.....	
40,851	51,000	1.39	.....	
41,652	52,000	1.58	.....	
42,453	53,000	1.86	.....	
43,254	54,000	2.16	.....	
44,055	55,000	2.54	.....	
44,856	56,000	3.20	.....	
44,920	56,080	.....	.....	Tensile strength.
0	0	3.35	.....	=16.8 per cent.

Fractured 1″.5 from grips. Appearance, fibrous, 90 per cent.; granular in spots, 10 per cent.

Diameter at fracture, ″.88. Area, .608 square inch. Contraction, 24.1 per cent.

Elongation of 5-inch sections, ″.86, ″.92*, ″.88, ″.78, ″.77, ″.75.

No. 2045.

Second 1-*inch bar.*

Mark, C.
Diameter, 1″.01.
Sectional area, .801 square inch.
Gauged length, 20″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
801	1,000	0.	0.	Initial load.
4,005	5,000	.0032	.....	
8,010	10,000	.0070	.....	
12,015	15,000	.0108	.....	
16,020	20,000	.0145	.....	
20,025	25,000	.0183	.....	
24,030	30,000	.0227	.0005	
24,831	31,000	.0235	.....	
25,632	32,000	.0248	.....	
26,433	33,000	.0259	.....	Elastic limit.
27,234	34,000	.0278	.....	
28,035	35,000	.0300	.....	
28,836	36,000	.0360	.....	
29,637	37,000	.0580	.....	
30,438	38,000	.16	.....	
31,239	39,000	.22	.....	
32,040	40,000	.26	.....	
32,841	41,000	.31	.....	
33,642	42,000	.38	.....	
34,443	43,000	.45	.....	
35,244	44,000	.53	.....	
36,045	45,000	.60	.....	
36,846	46,000	.74	.....	
37,647	47,000	.83	.....	
38,448	48,000	.92	.....	
39,249	49,000	1.04	.....	
40,050	50,000	1.15	.....	
40,851	51,000	1.34	.....	
41,652	52,000	1.47	.....	
42,453	53,000	1.64	.....	
43,254	54,000	1.96	.....	
44,055	55,000	2.25	.....	
44,856	56,000	2.68	.....	
45,657	57,000	3.38	.....	
45,880	57,220	.....	.....	Tensile strength.
0	0	4.14	.....	= 20.7 per cent.

Fractured 13″ from grips. Appearance, fibrous, slightly granular. Diameter at fracture, ″.83. Area, .541 square inch. Contraction, 32.5 per cent.

Elongation of 5-inch sections, ″.86, ″.91, 1″.27*, ″.98, ″.98, ″.87.

No. 2046.

First ⅞-inch bar.

Mark, A.
Diameter, ″.92.
Sectional area, .665 square inch.
Gauged length, 20″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
665	1,000	0.	0.	Initial load.
3,325	5,000	.0032	.....	
6,650	10,000	.0070	.....	
9,975	15,000	.0108	.....	
13,300	20,000	.0151	.....	
16,625	25,000	.0188	.....	
19,950	30,000	.0231	.0020	
20,615	31,000	.0246	.....	
21,280	32,000	.0255	.....	
21,945	33,000	.0265	.....	Elastic limit.
22,610	34,000	.0284	.....	
23,275	35,000	.40	.....	
23,940	36,000	.45	.....	
24,605	37,000	.53	.....	
25,270	38,000	.60	.....	
25,935	39,000	.69	.....	
26,600	40,000	.75	.....	
27,265	41,000	.85	.....	
27,930	42,000	.95	.....	
28,595	43,000	1.05	.....	
29,260	44,000	1.18	.....	
29,925	45,000	1.32	.....	
30,590	46,000	1.50	.....	
31,255	47,000	1.75	.....	
31,920	48,000	2.05	.....	
32,585	49,000	2.47	.....	
33,250	50,000	2.88	.....	
33,780	50,800	.....	.....	Tensile strength.
0	0	4.22	.....	=21.1 per cent.

Fractured 9″ from grips. Appearance, fibrous.
Diameter at fracture, ″.77. Area, .466 square inch. Contraction, 29.9 per cent.
Elongation of 5-inch sections, ″.93, 1″.17, 1″.03, 1″, 1″.02, 1″.42*

No. 2047.

First ⅞-inch bar.

Mark, B.
Diameter, ".92.
Sectional area, .665 square inch.
Gauged length, 20".

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
665	1,000	0.	0.	Initial load.
3,325	5,000	.0030	.....	
6,650	10,000	.0070	.....	
9,975	15,000	.0108	.....	
13,300	20,000	.0145	.....	
16,625	25,000	.0184	.....	
19,950	30,000	.0225	.0012	
20,615	31,000	.0240	.....	Elastic limit.
21,280	32,000	.0450	.....	
21,945	33,000	.1050	.....	
22,610	34,000	.26	.....	
23,275	35,000	.41	.....	
23,940	36,000	.48	.....	
24,605	37,000	.55	.....	
25,270	38,000	.63	.....	
25,935	39,000	.70	.....	
26,600	40,000	.79	.....	
27,265	41,000	.91	.....	
27,930	42,000	.98	.....	
28,595	43,000	1.12	.....	
29,100	43,760	.....	.....	Tensile strength.
0	0	1.24	.....	= 6.2 per cent.

Fractured 18" from grips. Appearance, fibrous. Part of the fracture separated the metal along imperfect weld in the rolling.

Diameter at fracture, ".82. Area, .528 square inch. Contraction, 20.6 per cent.

Elongation of 5-inch sections, ".27, ".27, ".27, ".45*, ".27, ".27.

No. 2048.

First $\frac{7}{8}$-inch bar.

Mark, C.
Diameter, ″.92.
Sectional area, .665 square inch.
Gauged length, 20″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
665	1,000	0.	0.	Initial load.
3,325	5,000	.0030	.....	
6,650	10,000	.0068	.....	
9,975	15,000	.0102	.....	
13,300	20,000	.0138	.....	
16,625	25,000	.0175	.....	
19,950	30,000	.0217	.0017	
20,615	31,000	.0230	.....	
21,280	32,000	.0240	.....	
21,945	33,000	.0250	.....	Elastic limit.
22,610	34,000	.0500	.....	
23,275	35,000	.41	.....	
23,940	36,000	.45	.....	
24,605	37,000	.51	.....	
25,270	38,000	.60	.....	
25,935	39,000	.67	.....	
26,600	40,000	.76	.....	
27,265	41,000	.86	.....	
27,930	42,000	.96	.....	
28,595	43,000	1.10	.....	
29,260	44,000	1.23	.....	
29,925	45,000	1.36	.....	
30,590	46,000	1.55	.....	
31,255	47,000	1.76	.....	
31,920	48,000	2.00	.....	
32,585	49,000	2.58	.....	
33,250	50,000	3.10	.....	
33,570	50,480	.....	.....	Tensile strength.
0	0	3.84	.....	=19.2.

Fractured 15″ from grips. Appearance, fibrous.
Diameter at fracture, ″.78. Area, .478 square inch. Contraction, 28.1 per cent.
Elongation of 5-inch sections, ″.86, 1″.03*, ″.97, ″.92, ″.92, ″.98.

No. 2049.

Second ⅞-inch bar.

Mark, A.
Diameter, ".92.
Sectional area, .665 square inch.
Gauged length, 20".

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
665	1,000	0.	0.	Initial load.
3,325	5,000	.0032	.....	
6,650	10,000	.0072	.....	
9,975	15,000	.0111	.....	
13,300	20,000	.0151	.....	
16,625	25,000	.0190	.....	
19,950	30,000	.0285	.0017	
20,615	31,000	.0244	.....	
21,220	32,000	.0258	.....	
21,945	33,000	.0268	.....	Elastic limit.
22,610	34,000	.22	.....	
23,275	35,000	.41	.....	
23,940	36,000	.48	.....	
24,605	37,000	.55	.....	
25,270	38,000	.62	.....	
25,935	39,000	.68	.....	
26,600	40,000	.80	.....	
27,265	41,000	.85	.....	
27,930	42,000	.97	.....	
28,595	43,000	1.10	.....	
29,260	44,000	1.24	.....	
29,925	45,000	1.35	.....	
30,590	46,000	1.53	.....	
31,255	47,000	1.70	.....	
31,920	48,000	1.95	.....	
32,585	49,000	2.30	.....	
33,250	50,000	2.95	.....	
33,380	50,200	.....	.....	Tensile strength.
0	0	3.76	.....	=18.8 per cent.

Fractured 6" from grips. Appearance, fibrous.
Diameter at fracture, ".77. Area, .466 square inch. Contraction, 29.9 per cent.
Elongation of 5-inch sections, ".89, ".86, ".91, 1".03, ".96, 1".10*.

No. 2050.

Second $\frac{7}{8}$-inch bar.

Mark, B.
Diameter, ″.92.
Sectional area, .665 square inch.
Gauged length, 20″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
665	1,000	0.	0.	Initial load.
3,325	5,000	.0032	.....	
6,650	10,000	.0070	.....	
9,975	15,000	.0105	.....	
13,300	20,000	.0147	.....	
16,625	25,000	.0185	.....	
19,950	30,000	.0230	.0018	
20,615	31,000	.0238	.....	
21,280	32,000	.0249	.....	
21,945	33,000	.0259	.....	Elastic limit.
22,610	34,000	.0274	.....	
23,275	35,000	.30	.....	
23,940	36,000	.46	.....	
24,605	37,000	.52	.....	
25,270	38,000	.60	.....	
25,935	39,000	.67	.....	
26,600	40,000	.76	.....	
27,265	41,000	.85	.....	
27,930	42,000	.96	.....	
28,595	43,000	1.07	.....	
29,260	44,000	1.21	.....	
29,925	45,000	1.35	.....	
30,590	46,000	1.55	.....	
31,255	47,000	1.76	.....	
31,920	48,000	2.03	.....	
32,585	49,000	2.40	.....	
33,250	50,000	2.95	.....	
33,790	50,810	.....	.....	Tensile strength.
0	0	3.95	.....	=19.8 per cent.

Fractured 2″ from grips. Appearance, fibrous.
Diameter at fracture, ″.76. Area, .454 square inch. Contraction, 31.7 per cent.
Elongation of 5-inch sections, 1″.09, 1″.07, ″.99, ″.99, ″.90, 1″.06.

No. 2051.

Second $\frac{7}{8}$-inch bar.

Mark, C.
Diameter, ″.92.
Sectional area, .665 square inch.
Gauged length, 20″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
665	1,000	0.	0.	Initial load.
3,325	5,000	.0081	.....	
6,650	10,000	.0067	.....	
9,975	15,000	.0107	.....	
13,300	20,000	.0144	.....	
16,625	25,000	.0181	.....	
19,950	30,000	.0223	.0010	
20,615	31,000	.0232	.....	
21,280	32,000	.0243	.....	Elastic limit.
21,945	33,000	.0550	.....	
22,610	34,000	.17	.....	
23,275	35,000	.40	.....	
23,940	36,000	.45	.....	
24,605	37,000	.50	.....	
25,270	38,000	.60	.....	
25,935	39,000	.67	.....	
26,600	40,000	.76	.....	
27,265	41,000	.85	.....	
27,930	42,000	.95	.....	
28,595	43,000	1.05	.....	
29,260	44,000	1.22	.....	
29,925	45,000	1.35	.....	
30,590	46,000	1.45	.....	
31,255	47,000	1.70	.....	
31,920	48,000	2.00	.....	
32,585	49,000	2.42	.....	
33,250	50,000	2.80	.....	
33,790	50,810	.....	.....	Tensile strength.
0	0	3.87	.....	=17.9 per cent.

Fractured 6″ from grips. Appearance, fibrous.
Diameter at fracture, ″.76. Area, .454 square inch. Contraction, 31.7 per cent.
Elongation of 5-inch sections, 1″.27*, ″.89, ″.87, ″.89, ″.92, ″.92.

No. 2052.

First ¾-inch bar.

Mark, A.
Diameter, ″.76.
Sectional area, .454 square inch.
Gauged length, 20″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
454	1,000	0.	0.	Initial load.
2,270	5,000	.0028	.....	
4,540	10,000	.0064	.....	
6,810	15,000	.0100	.....	
9,080	20,000	.0138	.....	
11,350	25,000	.0173	.....	
13,620	30,000	.0210	.0007	
14,074	31,000	.0220	.....	
14,528	32,000	.0232	.....	
14,982	33,000	.0238	.....	
15,436	34,000	.0259	.....	
15,890	35,000	.0262	.....	Elastic limit.
16,344	36,000	.0750	.....	
16,798	37,000	.37	.....	
17,252	38,000	.40	.....	
17,706	39,000	.50	.....	
18,160	40,000	.53	.....	
18,614	41,000	.64	.....	
19,068	42,000	.70	.....	
19,522	43,000	.81	.....	
19,976	44,000	.85	.....	
20,430	45,000	.96	.....	
20,884	46,000	1.11	.....	
21,338	47,000	1.25	.....	
21,792	48,000	1.41	.....	
22,246	49,000	1.58	.....	
22,700	50,000	1.85	.....	
23,154	51,000	2.08	.....	
23,608	52,000	2.58	.....	
23,860	52,560	.....	.....	Tensile strength.
0	0	2.73	.....	=13.7 per cent.

Fractured 7″ from grips. Appearance, fibrous.
Diameter at fracture, ″.67. Area, .353 square inch. Contraction, 22.2 per cent.
Elongation of 5-inch sections, ″.81*, ″.69, ″.70, ″.67, ″.67, ″.67.

No. 2053.

First ¾-inch bar.

Mark, B.
Diameter, ".76.
Sectional area, .454 square inch.
Gauged length, 20".

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
454	1,000	0.	0.	Initial load.
2,270	5,000	.0028	.....	
4,540	10,000	.0063	.....	
6,810	15,000	.0096	.....	
9,080	20,000	.0132	.....	
11,350	25,000	.0168	.....	
13,620	30,000	.0206	.....	
14,074	31,000	.0213	.....	
14,528	32,000	.0220	.....	
14,982	33,000	.0230	.....	
15,436	34,000	.0237	.....	
15,890	35,000	.0244	.....	Elastic limit.
16,344	36,000	.0257	.....	
16,798	37,000	.0275	.....	
17,252	38,000	.40	.....	
17,706	39,000	.44	.....	
18,160	40,000	.52	.....	
18,614	41,000	.60	.....	
19,068	42,000	.69	.....	
19,522	43,000	.75	.....	
19,976	44,000	.81	.....	
20,430	45,000	.93	.....	
20,884	46,000	1.06	.....	
21,338	47,000	1.19	.....	
21,792	48,000	1.35	.....	
22,246	49,000	1.43	.....	
22,700	50,000	1.68	.....	
23,154	51,000	2.00	.....	
23,608	52,000	2.27	.....	
24,062	53,000	2.45	.....	
24,310	53,550	.....	.....	Tensile strength.
0	0	3.08	.....	= 15.4 per cent.

Fractured ".85 from grips. Appearance, fibrous.
Diameter at fracture, ".66. Area, .342 square inch. Contraction, 24.7 per cent.
Elongation of 5-inch sections, ".92*, ".78, ".77, ".77, ".76, ".78.

No. 2054.

First ⅞-inch bar.

Mark, C.
Diameter, ″.76.
Sectional area, .454 square inch.
Gauged length, 20″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
454	1,000	0.	0.	Initial load.
2,270	5,000	.0033	.....	
4,540	10,000	.0073	.....	
6,810	15,000	.0113	.....	
9,080	20,000	.0153	.....	
11,350	25,000	.0193	.....	
13,620	30,000	.0234	.0012	
14,074	31,000	.0249	.....	
14,528	32,000	.0255	.....	
14,982	33,000	.0265	.....	
15,436	34,000	.0278	.....	Elastic limit.
15,890	35,000	.0295	.....	
16,344	36,000	.0312	.....	
16,798	37,000	.17	.....	
17,252	38,000	.40	.....	
17,706	39,000	.44	.....	
18,160	40,000	.50	.....	
18,614	41,000	.55	.....	
19,068	42,000	.64	.....	
19,522	43,000	.71	.....	
19,976	44,000	.81	.....	
20,430	45,000	.90	.....	
20,884	46,000	1.00	.....	
21,338	47,000	1.14	.....	
21,792	48,000	1.30	.....	
22,246	49,000	1.42	.....	
22,700	50,000	1.64	.....	
23,154	51,000	1.85	.....	
23,608	52,000	2.25	.....	
24,062	53,000	2.70	.....	
24,370	53,680	.....	.....	Tensile strength.
0	0	2.90	.....	= 14.5 per cent.

Fractured 2″ from grips. Appearance, fibrous.
Diameter at fracture, ″.68. Area, .363 square inch. Contraction, 20.0 per cent.
Elongation of 5-inch sections, ″.67, ″.72, ″.72, ″.75, ″.71, ″.72.

No. 2055.

Second ¾-inch bar.

Mark, A.
Diameter, ″.76.
Sectional area, .454 square inch.
Gauged length, 20″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
454	1,000	0.	0.	Initial load.
2,270	5,000	.0030	.....	
4,540	10,000	.0062	.....	
6,810	15,000	.0099	.....	
9,080	20,000	.0134	.....	
11,350	25,000	.0170	.....	
13,620	30,000	.0208	.0005	
14,074	31,000	.0217	.....	
14,528	32,000	.0225	.....	
14,982	33,000	.0233	.....	
15,436	34,000	.0243	.....	
15,890	35,000	.0253	.....	
16,344	36,000	.0261	.....	Elastic limit.
16,798	37,000	.22	.....	
17,252	38,000	.41	.....	
17,706	39,000	.48	.....	
18,160	40,000	.53	.....	
18,614	41,000	.62	.....	
19,068	42,000	.69	.....	
19,522	43,000	.77	.....	
19,976	44,000	.87	.....	
20,430	45,000	.95	.....	
20,884	46,000	1.10	.....	
21,338	47,000	1.20	.....	
21,792	48,000	1.35	.....	
22,246	49,000	1.53	.....	
22,700	50,000	.....	.....	Tensile strength.
0	0	1.67	.....	=8.4 per cent.

Fractured 5″ from grips. Appearance, fibrous, seamy.
Diameter at fracture, ″.66. Area, .342 square inch. Contraction, 24.7 per cent.
Elongation of 5-inch sections, ″.43, ″.41, ″.42, ″.42, ″.42, ″.68*.

No. 2056.

Second ⅞-inch bar.

Mark, B.
Diameter, ″.76.
Sectional area, .454 square inch.
Gauged length, 20″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
454	1,000	0.	0.	Initial load.
2,270	5,000	.0027	.....	
4,540	10,000	.0063	.....	
6,810	15,000	.0100	.....	
9,080	20,000	.0135	.....	
11,350	25,000	.0170	.....	
13,620	30,000	.0212	.0007	
14,074	31,000	.0218	.....	
14,528	32,000	.0225	.....	
14,982	33,000	.0233	.....	
15,436	34,000	.0241	.....	
15,890	35,000	.0251	.....	
16,344	36,000	.0258	.....	Elastic limit.
16,798	37,000	.0500	.....	
17,252	38,000	.40	.....	
17,706	39,000	.43	.....	
18,160	40,000	.53	.....	
18,614	41,000	.66	.....	
19,068	42,000	.69	.....	
19,522	43,000	.75	.....	
19,976	44,000	.87	.....	
20,430	45,000	.95	.....	
20,884	46,000	1.06	.....	
21,338	47,000	1.20	.....	
21,792	48,000	1.35	.....	
22,246	49,000	1.52	.....	
22,700	50,000	1.72	.....	
23,154	51,000	2.02	.....	
23,608	52,000	2.45	.....	
22,750	52,320	.....	.....	Tensile strength.
0	0	2.48	.....	=12.4 per cent.

Fractured 1″ from grips. Appearance, fibrous.

Diameter at fracture, ″.66. Area, .342 square inch. Contraction, 24.7 per cent.

Elongation of 5-inch sections, ″.67, ″.64, ″.60, ″.58, ″.66, ″.70.

No. 2057.

Second ¾-inch bar.

Mark, C.
Diameter, ″.76.
Sectional area, .454 square inch.
Gauged length, 20″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
454	1,000	0.	0.	Initial load.
2,270	5,000	.0031	.....	
4,540	10,000	.0072	.....	
6,810	15,000	.0114	.....	
9,080	20,000	.0156	.....	
11,350	25,000	.0194	.....	
13,620	30,000	.0238	.0015	
14,074	31,000	.0250	.....	
14,528	32,000	.0259	.....	
14,982	33,000	.0269	.....	
15,436	34,000	.0291	.....	Elastic limit.
15,890	35,000	.0750	.....	
16,344	36,000	.22	.....	
16,798	37,000	.41	.....	
17,252	38,000	.41	.....	
17,706	39,000	.48	.....	
18,160	40,000	.55	.....	
18,614	41,000	.61	.....	
19,068	42,000	.70	.....	
19,522	43,000	.78	.....	
19,976	44,000	.86	.....	
20,430	45,000	.97	.....	
20,884	46,000	1.10	.....	
21,338	47,000	1.22	.....	
21,792	48,000	1.38	.....	
22,246	49,000	1.55	.....	
22,700	50,000	1.80	.....	
23,154	51,000	2.07	.....	
23,608	52,000	2.57	.....	
23,980	52,820	.....	.....	Tensile strength.
0	0	2.83	.....	=14.2 per cent.

Fractured 1″.5 from grips. Appearance, fibrous.
Diameter at fracture, ″.68. Area, .363 square inch. Contraction, 20.0 per cent.
Elongation of 5-inch sections, ″.71, ″.77, ″.70, ″.67, ″.69, ″.70.

No. 2058.

First ⅝-inch bar.

Mark, A.
Diameter, ″.65.
Sectional area, .33 square inch.
Gauged length, 20″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
330	1,000	0.	0.	Initial load.
1,650	5,000	.0028	.....	
3,300	10,000	.0064	.....	
4,950	15,000	.0105	.....	
6,600	20,000	.0143	.....	
8,250	25,000	.0178	.....	
9,900	30,000	.0218	.0005	
10,230	31,000	.0225	.....	
10,560	32,000	.0234	.....	
10,890	33,000	.0243	.....	
11,220	34,000	.0250	.....	
11,550	35,000	.0260	.....	
11,880	36,000	.0269	.....	
12,210	37,000	.0281	.....	
12,540	38,000	.0290	.....	Elastic limit.
12,870	39,000	.1500	.....	
13,200	40,000	.55	.....	
13,530	41,000	.57	.....	
13,860	42,000	.66	.....	
14,190	43,000	.77	.....	
14,520	44,000	.85	.....	
14,850	45,000	.95	.....	
15,180	46,000	1.10	.....	
15,510	47,000	1.24	.....	
15,840	48,000	1.38	.....	
16,170	49,000	1.60	.....	
16,500	50,000	1.88	.....	
16,830	51,000	2.28	.....	
17,010	51,550	.....	.....	Tensile strength.
0	0	2.42	.....	=12.1 per cent.

Fractured 9½″ from grips. Appearance, fibrous, seamy.
Diameter at fracture, ″.58. Area, .264 square inch. Contraction, 20.0 per cent.
Elongation of 5-inch sections, ″.58, ″.57, ″.59, ″.56, ″.70*, ″.61.

No. 2059.

First ⅝-inch bar.

Mark, B.
Diameter, ″.65.
Sectional area, .33 square inch.
Gauged length, 20″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
330	1,000	0.	0.	Initial load.
1,650	5,000	.0027	.....	
3,300	10,000	.0065	.....	
4,950	15,000	.0098	.....	
6,600	20,000	.0135	.....	
8,250	25,000	.0170	.....	
9,900	30,000	.0210	.0005	
10,230	31,000	.0217	.....	
10,560	32,000	.0228	.....	
10,890	33,000	.0235	.....	
11,220	34,000	.0245	.....	
11,550	35,000	.0253	.....	
11,880	36,000	.0264	.....	
12,210	37,000	.0274	.....	Elastic limit.
12,540	38,000	.1050	.....	
12,870	39,000	.56	.....	
13,200	40,000	.61	.....	
13,530	41,000	.67	.....	
13,860	42,000	.74	.....	
14,190	43,000	.85	.....	
14,520	44,000	.95	.....	
14,850	45,000	1.05	.....	
15,180	46,000	1.20	.....	
15,510	47,000	1.35	.....	
15,840	48,000	1.53	.....	
16,170	49,000	1.83	.....	
16,500	50,000	2.08	.....	
16,830	51,000	2.47	.....	
16,980	51,450	.....	.....	Tensile strength.
0	0	2.62	.....	=13.1 per cent.

Fractured 3″ from grips. Appearance, fibrous.
Diameter at fracture, ″.58. Area, .264 square inch. Contraction, 20.0 per cent.
Elongation of 5-inch sections, ″.62, ″.61, ″.66, ″.69, ″.66, ″.64.

No. 2060.

Second §-inch bar.

Mark A.
Diameter, ″.65.
Sectional area, .33 square inch.
Gauged length, 20″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
330	1,000	0.	0.	Initial load.
1,650	5,000	.0090	.....	
3,300	10,000	.0070	.....	
4,950	15,000	.0105	.....	
6,600	20,000	.0150	.....	
8,250	25,000	.0185	.....	
9,900	30,000	.0228	.0010	
10,230	31,000	.0238	.....	
10,560	32,000	.0244	.....	
10,890	33,000	.0255	.....	
11,220	34,000	.0266	.....	
11,550	35,000	.0275	.....	
11,880	36,000	.0290	.....	
12,210	37,000	.0301	.....	Elastic limit.
12,540	38,000	.0326	.....	
12,870	39,000	.52	.....	
13,200	40,000	.58	.....	
13,530	41,000	.65	.....	
13,860	42,000	.72	.....	
14,190	43,000	.84	.....	
14,520	44,000	.92	.....	
14,850	45,000	1.04	.....	
15,180	46,000	1.18	.....	
15,510	47,000	1.32	.....	
15,840	48,000	1.50	.....	
16,170	49,000	1.75	.....	
16,500	50,000	2.02	.....	
16,830	51,000	2.46	.....	
16,920	51,270	.....	.....	Tensile strength.
0	0	2.50	.....	=12.5 per cent.

Fractured 9″.5 from grips. Appearance, fibrous, seamy.
Diameter at fracture, ″.57. Area, .255 square inch. Contraction, 22.7 per cent.
Elongation of 5-inch sections, ″.60, ″.72*, ″.59, ″.60, ″.59, ″.59.

No. 2061.

Second ⅞-inch bar.

Mark, B.
Diameter, ″.65.
Sectional area, .33 square inch.
Gauged length, 20′′.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
330	1,000	0.	0.	
1,650	5,000	.0030	.....	
3,300	10,000	.0067	.....	
4,950	15,000	.0103	.....	
6,600	20,000	.0140	.....	
8,250	25,000	.0178	.....	
9,900	30,000	.0216	.0006	
10,240	31,000	.0227	.....	
10,560	32,000	.0235	.....	
10,890	33,000	.0245	.....	
11,220	34,000	.0254	.....	
11,550	35,000	.0264	.....	
11,880	36,000	.0274	.....	
12,210	37,000	.0284	.....	Elastic limit.
12,540	38,000	.31	.....	
12,870	39,000	.50	.....	
13,200	40,000	.57	.....	
13,530	41,000	.63	.....	
13,860	42,000	.70	.....	
14,190	43,000	.81	.....	
14,520	44,000	.90	.....	
14,850	45,000	1.00	.....	
15,180	46,000	1.16	.....	
15,510	47,000	1.34	.....	
15,840	48,000	1.48	.....	
16,170	49,000	1.75	.....	Tensile strength.
0	0	1.78	.....	=8.9 per cent.

Fractured 19′′ from grips. Appearance, fibrous, seamy.
Diameter at fracture, ″.57. Area, .255 square inch. Contraction, 22.7 per cent.
Elongation of 5-inch sections, ″.42, ″.41, ″.41, ″.53*, ″.43, ″.43.

No. 2062.

First ½-inch bar.

Mark, A.
Diameter, ".515.
Sectional area, .21 square inch.
Gauged length, 20".

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
210	1,000	0.	0.	Initial load.
1,050	5,000	.0030	.....	
2,100	10,000	.0076	.....	
3,150	15,000	.0105	.....	
4,200	20,000	.0142	.....	
5,250	25,000	.0179	.....	
6,300	30,000	.0217	.0004	
7,350	35,000	.0255	.....	
7,560	36,000	.0263	.....	
7,770	37,000	.0278	.....	
7,980	38,000	.0283	.....	Elastic limit.
8,190	39,000	.0475	.....	
8,400	40,000	.1100	.....	
8,610	41,000	.21	.....	
8,820	42,000	.68	.....	
9,030	43,000	.75	.....	
9,240	44,000	.84	.....	
9,450	45,000	.93	.....	
9,660	46,000	1.05	.....	
9,870	47,000	1.22	.....	
10,080	48,000	1.40	.....	
10,290	49,000	1.66	.....	
10,500	50,000	1.83	.....	
10,710	51,000	2.10	.....	
10,920	52,000	2.63	.....	
11,020	52,480	.....	.....	Tensile strength.
0	0	2.64	.....	= 13.2 per cent.

Fractured 4" from grips. Appearance, fibrous.
Diameter at fracture, ".47. Area, .173 square inch. Contraction, 17.6 per cent.
Elongation of 5-inch sections, ".68, ".68, ".62, ".63, ".71, ".72.

No. 2063.

First ½-inch bar.

Mark, B.
Diameter, ″.515.
Sectional area, .21 square inch.
Gauged length, 20″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
210	1,000	0.	0.	Initial load.
1,050	5,000	.0028	.....	
2,100	10,000	.0068	.....	
3,150	15,000	.0104	.....	
4,200	20,000	.0140	.....	
5,250	25,000	.0177	.....	
6,300	30,000	.0217	.0003	
7,350	35,000	.0256	.....	
7,560	36,000	.0265	.....	
7,770	37,000	.0275	.....	
7,980	38,000	.0283	.....	
8,190	39,000	.0291	.....	Elastic limit.
8,400	40,000	.42	.....	
8,610	41,000	.71	.....	
8,820	42,000	.75	.....	
9,030	43,000	.83	.....	
9,240	44,000	.91	.....	
9,450	45,000	1.05	.....	
9,660	46,000	1.20	.....	
9,870	47,000	1.39	.....	
10,080	48,000	1.55	.....	
10,290	49,000	1.75	.....	
10,480	49,900	.....	.....	Tensile strength.
0	0	1.98	.....	=9.9 per cent.

Fractured 13″ from grips. Appearance, fibrous.
Diameter at fracture, ″.46. Area, .166 square inch. Contraction, 21.0 per cent.
Elongation of 5-inch sections, ″.45, ″.47, ″.47, ″.48, ″.54*, ″.47.

No. 2064.

Second ½-inch bar.

Mark, A.
Diameter, ".515.
Sectional area, .21 square inch.
Gauged length, 20".

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
210	1,000	0.	0.	Initial load.
1,050	5,000	.0027	.....	
2,100	10,000	.0061	.....	
3,150	15,000	.0098	.....	
4,200	20,000	.0132	.....	
5,250	25,000	.0169	.....	
6,300	30,000	.0207	.0004	
7,350	35,000	.0246	.....	
7,560	36,000	.0256	.....	
7,770	37,000	.0270	.....	
7,980	38,000	.0280	.....	Elastic limit.
8,190	39,000	.0850	.....	
8,400	40,000	.56	.....	
8,610	41,000	.61	.....	
8,820	42,000	.67	.....	
9,030	43,000	.76	.....	
9,240	44,000	.86	.....	
9,450	45,000	.97	.....	
9,660	46,000	1.09	.....	
9,870	47,000	1.24	.....	
10,080	48,000	1.45	.....	
10,290	49,000	1.66	.....	
10,500	50,000	1.90	.....	
10,700	50,950	.....	.....	Tensile strength.
0	0	2.20	.....	=11.0 per cent.

Fractured 10" from grips. Appearance, fibrous.
Diameter at fracture, ".47. Area, .173 square inch. Contraction, 17.6 per cent.
Elongation of 5-inch sections, ".52, ".53*, ".54, ".60, ".53, ".54.

No. 2065.

Second ½-inch bar.

Marks B.
Diameter, ″.515.
Sectional area, .21 square inch.
Gauged length, .20″

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
210	1,000	0.	0.	Initial load.
1,050	5,000	.0029	.....	
2,100	10,000	.0067	.....	
3,150	15,000	.0104	.....	
4,200	20,000	.0148	.....	
5,250	25,000	.0178	.....	
6,300	30,000	.0220	.0005	
7,350	35,000	.0265	.....	
7,560	36,000	.0275	.....	Elastic limit.
7,770	37,000	.0293	.....	
7,980	38,000	.0320	.....	
8,190	39,000	.36	.....	
8,400	40,000	.56	.....	
8,610	41,000	.60	.....	
8,820	42,000	.68	.....	
9,030	43,000	.77	.....	
9,240	44,000	.85	.....	
9,450	45,000	.95	.....	
9,660	46,000	1.08	.....	
9,870	47,000	1.23	.....	
10,080	48,000	1.55	.....	
10,290	49,000	1.78	.....	
10,500	50,000	2.03	.....	
10,710	51,000	2.28	.....	
10,920	52,000	.....	.....	Tensile strength.
0	0	2.74	.....	=13.7 per cent.

Fractured 3″ from grips. Appearance, fibrous.
Diameter at fracture, ″.47. Area, .173 square inch. Contraction, 17.6 per cent.
Elongation of 5-inch sections, ″.72, ″.72, ″.68, ″.64, ″.70, ″.69.

No. 2066.

First ⅜-inch bar.

Mark, A.
Diameter, ".370.
Sectional area, .107 square inch.
Gauged length, 20".
Surface cracks along one side of the bar before testing.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
107	1,000	0.	0.	Initial load.
535	5,000	.0037	.....	
1,070	10,000	.0083	.....	
1,605	15,000	.0122	.....	
2,140	20,000	.0159	.....	
2,675	25,000	.0202	.....	
3,210	30,000	.0236	.....	
3,745	35,000	.0282	.0018	
3,852	36,000	.0293	.....	
3,959	37,000	.0298	.....	
4,066	38,000	.0306	.....	Elastic limit.
4,173	39,000	.0322	.....	
4,280	40,000	.0355	.....	
4,387	41,000	.18	.....	
4,494	42,000	.40	.....	
4,601	43,000	.53	.....	
4,708	44,000	.62	.....	
4,815	45,000	.72	.....	
4,922	46,000	.81	.....	
5,029	47,000	.94	.....	
5,136	48,000	1.11	.....	
5,190	48,500	.....	.....	Tensile strength.
0	0	1.17	.....	=5.9 per cent.

Fractured 4" from grips. Appearance, fibrous.
Diameter at fracture, ".35. Area, .096 square inch. Contraction, 10.3 per cent.
Elongation of 5-inch sections, ".31, ".29, ".29, ".29, ".30, ".29.

No. 2067.

First ⅞-inch bar.

Mark, B.
Diameter, ″.370.
Sectional area, .107 square inch.
Gauged length, 20″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
107	1,000	0.	0.	Initial load.
535	5,000	.0030	.....	
1,070	10,000	.0068	.....	
1,605	15,000	.0104	.....	
2,140	20,000	.0140	.....	
2,675	25,000	.0183	.....	
3,210	30,000	.0214	.....	
3,745	35,000	.0252	.....	
3,852	36,000	.0260	.....	
3,959	37,000	.0266	.....	
4,066	38,000	.0275	.....	
4,173	39,000	.0290	.....	
4,280	40,000	.0299	.....	Elastic limit.
4,387	41,000	.0315	.....	
4,494	42,000	.0500	.....	
4,601	43,000	.40	.....	
4,708	44,000	.55	.....	
4,815	45,000	.71	.....	
4,922	46,000	.80	.....	
5,029	47,000	.91	.....	
5,136	48,000	1.08	.....	
5,190	48,500	.....	.....	Tensile strength.
0	0	1.15	.....	=5.8 per cent.

Fractured 3″ from grips. Appearance, fibrous.
Diameter at fracture, ″.34. Area, .091 square inch. Contraction, 15.0 per cent.
Elongation of 5-inch sections, ″.31, ″.31, ″.29, ″.28, ″.27, ″.28.

TABULATION OF TENSILE TESTS OF COMMON WROUGHT IRON, ROUND BARS, IN THE CONDITION THEY CAME FROM THE ROLLS.

No. of test.	Mark on specimen.	Diameter.	Sectional area.	Elastic limit.		Ultimate strength.		Elongation in 20 inches.		Area at fracture.	Contraction of area.	Appearance of fracture.	Elongation of 8-inch sections.
				Total.	Per square inch.	Total.	Per square inch.	Inches.	Per cent.				
		Inches.	*Sq. in.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*			*In. Sq. in.*	*Per ct.*		
2031	A.....	2.02	3.20	80,000	25,000	154,100	48,160	3.63	18.2	Diam. 1.70=2.27	29.1	Fibrous, trace of granulation..	1".68*, ".90, ".97, ".90, ".86, ".86.
2032	B.....	2.02	3.20	73,600	23,000	143,100	44,720	1.82	9.1	Diam. 1.69=2.24	30.0	do.....	.77*, .43, .50, .46, .43, .42.
2033	C.....	2.02	3.20	80,000	25,000	147,800	46,190	2.78	13.9	Diam. 1.79=2.52	21.2	Fibrous.....	.60, .61, .63, .91*, .61, .61.
2034	A.....	2.02	3.20	83,200	26,000	149,400	46,690	2.26	11.3	Diam. 1.79=2.52	21.2	..... do.....	.57, .56, .57, .54, .59, .57.
2035	B.....	2.02	3.20	83,200	26,000	159,620	49,880	4.11	20.5	Diam. 1.70=2.27	29.1	Fibrous, 90 per cent.; granular, 10 per cent.	.97, .92, .95, 1.28*, .96, 1.01.
2036	C.....	2.02	3.20	80,000	25,000	151,000	47,190	2.40	12.0	Diam. 1.87=2.75	14.1	Fibrous.....	.56, .62, .65, .57, .56, .47.
2037	A.....	1.52	1.815	54,450	30,000	89,150	49,120	3.85	19.3	Diam. 1.31=1.35	25.6	Fibrous, trace of granulation..	.96, .97, 1.07*, .94, .87, .88.
2038	B.....	1.52	1.815	54,450	30,000	89,940	49,550	4.79	23.9	Diam. 1.27=1.27	30.0	Fibrous.....	1.10, 1.17, 1.42*, 1.20, 1, 1.07.
2039	C.....	1.52	1.815	58,080	32,000	91,300	50,300	4.80	24.0	Diam. 1.27=1.27	30.0	Fibrous, trace of granulation..	.94, 1.13, 1.55*, 1.07, 1.05, .98.
2040	A	1.01	.801	28,836	36,000	41,652	52,000	1.15	5.8	Diam. .93=.679	15.2	Fibrous, 60 per cent.; granular, 40 per cent.	.28, .28, .28, .30, .29, .30.
2041	B.....	1.01	.801	30,438	38.000	45,440	56,730	1.58	7.9	Diam. .94=.694	13.4	Fibrous, 90 per cent.; granular, 10 per cent.	.36, .38, .45*, .38, .37, .39.
2042	C.....	1.01	.801	28,836	36,000	39,180	48,910	.77	3.9	Diam. .96=.724	9.6	Fibrous, 80 per cent.; granular, 20 per cent.	.23*, .25*, .17, .18, .17, .19.
2043	A.....	1.01	.801	25,632	32,000	44,980	56,150	3.53	17.7	Diam. .88=.608	24.1	Fibrous, 85 per cent.; granular in spots.	.80, .83, .83, .99*, .88, .83.
2044	B.....	1.01	.801	26,433	33,000	44,920	56,080	3.35	16.8	Diam. .88=.608	24.1	Fibrous, 90 per cent.; granular in spots.	.86, .92*, .88, .78, .77, .75.
2045	C.....	1.01	.801	26,433	33,000	45,780	57,280	4.14	20.7	Diam. .83=.541	32.5	Fibrous, slightly granular.....	.86, .91, 1.27*, .96, .96, .87.
2046	A.....	.92	.665	21,945	33,000	33,780	50,800	4.22	21.1	Diam. .77=.466	29 9	Fibrous.....	.93, 1.17, 1.03, 1. 1 02, 1.42*.
2047	B.....	.92	.665	20,615	31,000	20,100	43,760	1.24	6.2	Diam. .82=.528	20.6	Fibrous, partly along imperfect weld.	.27, .27, .27, .45*, .27, .27.
2048	C.....	.92	.665	21,945	33,000	33,570	50,480	3.84	19.2	Diam. .78=.478	28.1	Fibrous.....	.86, 1.03, .97, .92, .92, .98.
2049	A.....	.92	.665	21,945	33,000	33,890	50,950	3.76	18.8	Diam. .77=.466	29.9	.....do.....	.88, .86, .91, 1.03, .96, 1.10*.
2050	B.....	.92	.665	21,945	33,000	33,790	50,810	3.96	19.8	Diam. .76=.454	31.7	.....do.....	1.09, 1.07, .99, .99, .90, 1 06.
2051	C.....	.92	.665	21,280	32,000	33,790	50,810	3.57	17.9	Diam. .76=.454	31.7	.....do.....	1.27*, .89, .87, .89, .92, .92.
2052	A.....	.76	.454	15,890	35,000	23,860	52,560	2.73	13.7	Diam. .67=.353	22.2	.....do.....	.81*, .69, .70, 67, .67, .67.
2053	B.....	.76	.454	15,890	35,000	24,310	53,550	3.08	15.4	Diam. .66=.342	24.7	.....do.....	.92*, .78, .77, .77, .76, .78.
2054	C.....	.76	.454	15,436	34,000	24,370	53,680	2.90	14.5	Diam. .68=.363	20.0	.....do.....	.67, .72, .72, .75, .71, .72.
2055	A.....	.76	.454	16,344	36,000	22,700	50,000	1.67	8.4	Diam. .66=.342	24.7	Fibrous, scamy.....	.43, .41, .42, .42, .42, .66*.
2056	B.....	.76	.454	16,344	36,000	23,750	52,320	2.48	12.4	Diam. .66=.342	24.7	Fibrous.....	.67, .64, .60, .58, .66, .70.
2057	C.....	.76	.454	15,436	34,000	23,980	52,820	2.83	14.2	Diam. .68=.363	20.0	.....do.....	.71, .77, .70, .67, .69, .70.
2058	A.....	.65	.33	12,540	38,000	17,010	51,550	2.42	12.1	Diam. .58=.264	20.0	Fibrous, scamy.....	.58, .57, .59, .56, .70*, .61.
2059	B.....	.65	.33	12,210	37,000	16,980	51,450	2 62	13.1	Diam. .58=.264	20.0	Fibrous.....	.62, .61, .66, .69, .66, .64.
2060	A.....	.65	.33	12,210	37,000	16,920	51,270	2.50	12.5	Diam. .57=.255	22.7	Fibrous, scamy.....	.60, .72*, .59, .60, .59, .59.

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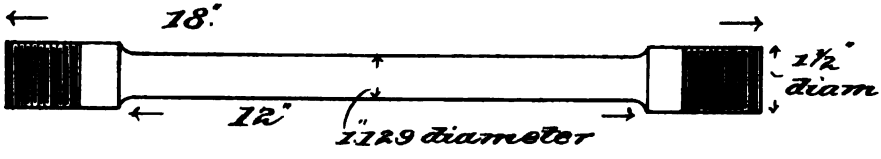
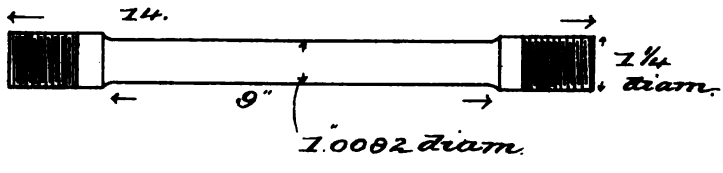
WROUGHT-IRON SPECIMENS.

No. of test.	Marks.	Diameter.	Sectional area.	Elastic limit.		Tensile strength.		Elongation in 6 inches.	
				Total.	Per sq. inch.	Total.	Per sq. inch.		
		Inch.	*Sq. inch.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Inches.*	*Per cent.*
1567	D. H. & Co..	.564	.25	9,120	36,480	13,120	52,480	1.43	23.8
1568	J. A. W.....	.564	.25	9,710	38,840	12,720	50,880	1.67	27.8

No. of test.	Area at fracture.		Contraction of area.	Appearance of fracture.	Elongation of inch sections.
	Diameter.	Area.			
	Inch.	*Sq. inch.*	*Per cent.*		
1567	.42	.1385	44.6	Fibrous	".18, ".43*, ".26, ".20, ".18, ".18.
1568	.40	.1257	49.7	....do.....	".20, ".26, ".52*, ".28, ".23, ".18.

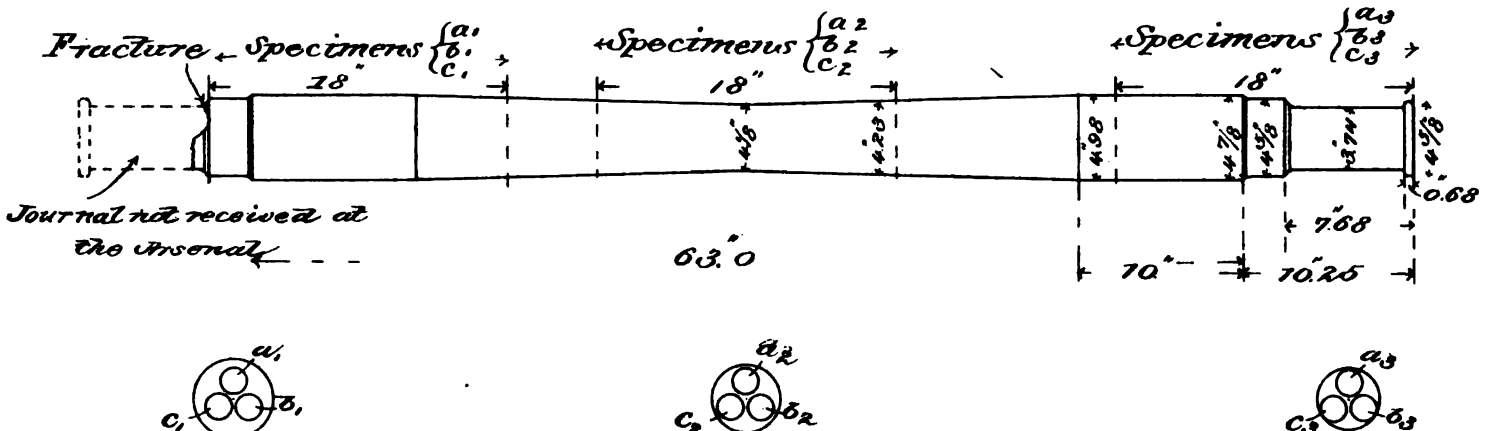
Form of specimens





H Ex 45 50 2

Wt iron passenger axle, from the Boston and Providence R.R. Journal broken at the Bussey Bridge disaster, March 74, 1887.



H Ex 45 50 2

RAILWAY AXLES.

TENSILE TESTS OF SPECIMENS FROM WROUGHT IRON AND STEEL TENDER AND PASSENGER CAR AXLES.

Marks, $\frac{B \& P_1}{A}$ No. 1595.

Diameter, 1″.129. Sectional area, 1 square inch. Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	Initial load.
5,000	5,000	.0015	0.	
10,000	10,000	.0034	0.	
15,000	15,000	.0051	0.	
18,000	18,000	.0063	0.	
20,000	20,000	.0071	.0065	
20,500	20,500	.0082	.....	
21,000	21,000	.0086	.....	
21,500	21,500	.0093	.....	
22,000	22,000	.0098	.....	Elastic limit.
22,500	22,500	.0117	.....	
23,000	23,000	.0128	.....	
23,500	23,500	.0161	.....	
24,000	24,000	.0189	.....	
24,500	24,500	.0217	.....	
25,000	25,000	.0249	.0167	
26,000	26,000	.0307	.....	
27,000	27,000	.0400	.....	
28,000	28,000	.0510	.....	
29,000	29,000	.0810	.....	
30,000	30,000	.1050	.....	
31,000	31,000	.1310	.....	Snapping sounds; cracks opened in cylindrical surface of stem.
32,000	32,000	.1660	.....	
33,000	33,000	.1960	.....	
34,000	34,000	.22	.....	
35,000	35,000	.26	.....	
36,000	36,000	.30	.....	
37,000	37,000	.34	.....	
38,000	38,000	.40	.....	
39,000	39,000	.46	.....	
40,000	40,000	.52	.....	
41,000	41,000	.58	.....	
42,000	42,000	.67	.....	
43,000	43,000	.78	.....	
43,520	43,520	.88	.....	Tensile strength.
0	0	.94	.....	= 9.4 per cent.

Fractured 3″.10 from neck, and 6″.2 from outside end of specimen.

Appearance of fracture, fibrous, with a granular spot ″.20 by ″.20 at the circumference. Cracks opened in stem in vicinity of place of rupture. Tore apart in detail. Contains cinder.

Diameter at fracture, 1″; area, .785 sq. inch; contraction, 21.5 per cent.

Elongation of inch sections, ″.08, ″.08, ″.07, ″.08, ″.08, ″.07, ″.09, ″.13, ″.17*, ″.09.

No. 1596.

Marks, $\frac{B \& P_1}{B_1}$
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	Initial load.
5,000	5,000	.0015	0.	
10,000	10,000	.0033	0.	
15,000	15,000	.0052	.....	
18,000	18,000	.0068	.....	
19,000	19,000	.0068	.....	
20,000	20,000	.0074	.0007	
20,500	20,500	.0081	.....	
21,000	21,000	.0085	.....	
21,500	21,500	.0091	.....	
22,000	22,000	.0098	.....	
22,500	22,500	.0106	.....	
23,000	23,000	.0115	.....	Elastic limit.
23,500	23,500	.0131	.....	
24,000	24,000	.0150	.....	
24,500	24,500	.0163	.....	
25,000	25,000	.0198	.0106	
26,000	26,000	.0250	.....	
27,000	27,000	.0340	.....	
28,000	28,000	.0442	.....	
29,000	29,000	.0575	.....	
30,000	30,000	.0812	.....	
31,000	31,000	.1090	.....	
32,000	32,000	.1350	.....	
33,000	33,000	.1680	.....	
34,000	34,000	.20	.....	
35,000	35,000	.23	.....	
36,000	36,000	.29	.....	
37,000	37,000	.33	.....	
38,000	38,000	.39	.....	
39,000	39,000	.44	.....	
39,510	39,510	.49	.....	Tensile strength.
0	0	.58	.....	=5.8 per cent.

Fractured 5″.15 from neck, and 10″.60 from outside end of specimen.

Appearance, fibrous, 65 per cent.; granular, 35 per cent. Contains cinder. Opened cracks along the surface of stem. These cracks were developed during the latter part of the test.

Rupture occurred in detail, the metal in the fibrous part gradually tearing apart. The granular part fractured suddenly.

Diameter at fracture, 1″.05. Area, .866 square inch. Contraction, 13.4 per cent.

Elongation of inch sections, ″.06, ″.04, ″.04, ″.05, ″.04, ″.08, ″.11*, ″.07, ″.04, ″.05.

No. 1597.

Marks, $\frac{B \& P_1}{C_1}$
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	Initial load.
5,000	5,000	.0015	0.	
10,000	10,000	.0032	0.	
15,000	15,000	.0050	0.	
18,000	18,000	.0062	.....	
19,000	19,000	.0068	.....	
20,000	20,000	.0073	.....	
20,500	20,500	.0078	.....	
21,000	21,000	.0083	.....	
21,500	21,500	.0087	.....	
22,000	22,000	.0093	.....	
22,500	22,500	.0100	.....	Elastic limit.
23,000	23,000	.0113	.....	
23,500	23,500	.0129	.....	
24,000	24,000	.0149	.....	
24,500	24,500	.0168	.....	
25,000	25,000	.0196	.....	
26,000	26,000	.0248	.....	
27,000	27,000	.0343	.....	
28,000	28,000	.0468	.....	
29,000	29,000	.0650	.....	
30,000	30,000	.0855	.....	
31,000	31,000	.1120	.....	
32,000	32,000	.1380	.....	
33,000	33,000	.1725	.....	
34,000	34,000	.2060	.....	
35,000	35,000	.25	.....	Cracks open in stem.
36,000	36,000	.30	.....	
37,000	37,000	.33	.....	
38,000	38,000	.39	.....	
39,000	39,000	.45	.....	
40,000	40,000	.52	.....	
41,000	41,000	.60	.....	
42,000	42,000	.70	.....	
42,800	42,800	.72	.....	Tensile strength.
0	0	.88	.....	= 8.8 per cent.

Fractured 3″.5 from neck, and 6″.6 from the outside end of specimen. Appearance, fibrous; contains cinder. Opened cracks along the surface of stem.

Diameter at fracture, 1″.06. Area, .882 square inch. Contraction, 11.8 per cent.

Elongation of inch sections, ″.06, ″.08, ″.09, ″.07, ″.07, ″.08, ″.09, ″.17*, ″.10, ″.07.

No. 1598.

Marks, $\frac{B \& P_1}{A_2}$
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	1,000	0.	0.	Initial load.
5,000	5,000	.0015	0.	
10,000	10,000	.0032	0.	
15,000	15,000	.0049	0.	
18,000	18,000	.0061	.....	
19,000	19,000	.0065	.....	
20,000	20,000	.0069	.....	
20,500	20,500	.0071	.....	
21,000	21,000	.0072	.....	
21,500	21,500	.0073	.....	
22,000	22,000	.0075	.....	
22,500	22,500	.0078	.....	
23,000	23,000	.0080	.....	
23,500	23,500	.0083	.....	
24,000	24,000	.0086	.....	
24,500	24,500	.0088	.....	Elastic limit.
25,000	25,000	.0101	.....	
25,500	25,500	.0145	.....	
26,000	26,000	.0226	.....	
26,500	26,500	.0367	.....	
27,000	27,000	.0481	.....	
28,000	28,000	.0580	.....	
29,000	29,000	.0775	.....	
30,000	30,000	.1000	.....	
31,000	31,000	.1230	.....	
32,000	32,000	.1476	.....	
33,000	33,000	.1750	.....	
34,000	34,000	.2075	.....	
35,000	35,000	.24	.....	
36,000	36,000	.27	.....	
37,000	37,000	.32	.....	
38,000	38,000	.36	.....	
39,000	39,000	.40	.....	
40,000	40,000	.46	.....	
41,000	41,000	.51	.....	
42,000	42,000	.58	.....	
43,000	43,000	.65	.....	
44,000	44,000	.74	.....	
45,000	45,000	.85	.....	
46,000	46,000	1.00	.....	
47,000	47,000	1.21	.....	
47,890	47,890	1.57	.....	Tensile strength.
0	0	1.73	.....	=17.3 per cent.

Fractured 3″.1 from neck. Appearance, fibrous; trace of granulation. Seam at place of rupture.

Diameter at fracture, ″.94. Area, .694 square inch. Contraction, 30.6 per cent.

Elongation of inch sections, ″.14, ″.31*, ″.16, ″.14, ″.15, ″.18, ″.20, ″.17, ″.14, ″.14.

No. 1599.

Marks, $\frac{B \& P_1}{B_2}$
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	1,000	0.	0.	Initial load.
5,000	5,000	.0015	0.	
10,000	10,000	.0034	0.	
15,000	15,000	.0053	.0001	
18,000	18,000	.0065	.....	
20,000	20,000	.0073	.0005	
20,500	20,500	.0077	.....	
21,000	21,000	.0080	.....	
21,500	21,500	.0082	.....	
22,000	22,000	.0084	.....	
22,500	22,500	.0089	.....	
23,000	23,000	.0093	.....	Elastic limit.
23,500	23,500	.0101	.....	
24,000	24,000	.0112	.....	
24,500	24,500	.0125	.....	
25,000	25,000	.0150	.....	
26,000	26,000	.0198	.....	
27,000	27,000	.0301	.....	
28,000	28,000	.0440	.....	
29,000	29,000	.0580	.....	
30,000	30,000	.0775	.....	
31,000	31,000	.1025	.....	
32,000	32,000	.1296	.....	
33,000	33,000	.1620	.....	
34,000	34,000	.1910	.....	
35,000	35,000	.2260	.....	
36,000	36,000	.27	.....	
37,000	37,000	.30	.....	
38,000	38,000	.34	.....	
39,000	39,000	.39	.....	
40,000	40,000	.45	.....	Surface cracks in sight.
41,000	41,000	.52	.....	
42,000	42,000	.58	.....	
43,000	43,000	.68	.....	
44,000	44,000	.77	.....	
45,000	45,000	.89	.....	
46,000	46,000	1.07	.....	
47,000	47,000	1.31	.....	
47,440	47,440	1.59	.....	Tensile strength.
0	0	1.79	.....	=17.9 per cent.

Fractured 5″.3 from neck. Appearance, fibrous, slightly granular.
Diameter at fracture, ″.95. Area, .709 square inch. Contraction, 29.1 per cent.
Elongation of inch sections, ″.14, ″.17, ″.24, ″.39*, ″.19, ″.15, ″.14, ″.14, ″.11, ″.12.

No. 1600.

Marks, $\frac{B \& P}{C_3}$
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	1,000	0.	0.	Initial load.
5,000	5,000	.0016	0.	
10,000	10,000	.0032	0.	
15,000	15,000	.0051	.....	
18,000	18,000	.0062	.0001	
20,000	20,000	.0070	.....	
20,500	20,500	.0072	.....	
21,000	21,000	.0074	.....	
21,500	21,500	.0077	.....	
22,000	22,000	.0080	.....	
22,500	22,500	.0083	.....	
23,000	23,000	.0088	.....	Elastic limit.
23,500	23,500	.0100	.....	
24,000	24,000	.0108	.....	
24,500	24,500	.0125	.....	
25,000	25,000	.0145	.....	
26,000	26,000	.0202	.....	
27,000	27,000	.0400	.....	
28,000	28,000	.0558	.....	
29,000	29,000	.0750	.....	
30,000	30,000	.1000	.....	
31,000	31,000	.1270	.....	
32,000	32,000	.1575	.....	
33,000	33,000	.1900	.....	
34,000	34,000	.2235	.....	Opening along a seam.
35,000	35,000	.27	.....	
36,000	36,000	.31	.....	
37,000	37,000	.35	.....	
38,000	38,000	.40	.....	
39,000	39,000	.44	.....	
40,000	40,000	.51	.....	
41,000	41,000	.59	.....	
42,000	42,000	.67	.....	
43,000	43,000	.78	.....	
44,000	44,000	.92	.....	
45,000	45,000	1.03	.....	
46,000	46,000	1.28	.....	
46,510	46,510	1.53	.....	Tensile strength.
0	0	1.66	.....	= 16.6 per cent.

Fractured 6″ from neck. Appearance, fibrous, 65 per cent; granular, 35 per cent.

Diameter at fracture, ″.99. Area, .770 square inch. Contraction, 23.0 per cent.

Elongation of inch sections, ″.13, ″.14, ″.16, ″.17, ″.18, ″.25*, ″.22, ″.15, ″.13, ″.13.

No. 601.

Marks, $\frac{B \& P_1}{A_2}$
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	1,000	0.	0.	Initial load.
5,000	5,000	.0016	0.	
10,000	10,000	.0033	0.	
15,000	15,000	.0052	0.	
18,000	18,000	.0063	.....	
19,000	19,000	.0070	.....	
20,000	20,000	.0074	.0003	
20,500	20,500	.0078	.....	
21,000	21,000	.0080	.....	
21,500	21,500	.0082	.....	
22,000	22,000	.0087	.....	
22,500	22,500	.0092	.....	Elastic limit.
23,000	23,000	.0103	.....	
23,500	23,500	.0118	.....	
24,000	24,000	.0123	.....	
24,500	24,500	.0155	.....	
25,000	25,000	.0192	.....	
26,000	26,000	.0258	.....	
27,000	27,000	.0329	.....	
28,000	28,000	.0456	.....	
29,000	29,000	.0635	.....	
30,000	30,000	.0830	.....	
31,000	31,000	.1085	.....	
32,000	32,000	.1350	.....	
33,000	33,000	.1660	.....	
34,000	34,000	.2000	.....	
35,000	35,000	.23	.....	
36,000	36,000	.28	.....	
37,000	37,000	.32	.....	
38,000	38,000	.36	.....	
39,000	39,000	.41	.....	Surface cracks open.
40,000	40,000	.47	.....	
41,000	41,000	.52	.....	
42,000	42,000	.60	.....	
43,000	43,000	.67	.....	
44,000	44,000	.78	.....	
45,000	45,000	.89	.....	
46,000	46,000	1.03	.....	
47,000	47,000	1.37	.....	
47,500	47,500	1.47	.....	Tensile strength.
0	0	1.54	.....	= 15.4 per cent.

Fractured 5″.15 from neck, and 8″.2 from outside end of specimen. Appearance, fibrous; trace of granulation. Opened cracks in surface of stem.

Diameter at fracture, 1″.01. Area, .801 square inch. Contraction, 19.9 per cent.

Elongation of inch sections, ″.14, ″.15, ″.17, ″.16, ″.16, ″.16, ″.27*, ″.13, ″.10, ″.10.

No. 1602.

Marks, $\frac{B \& P_1}{B_2}$
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	1,000	0.	0.	Initial load.
5,000	5,000	.0015	0.	
10,000	10,000	.0034	0.	
15,000	15,000	.0051	.0001	
18,000	18,000	.0064	.....	
19,000	19,000	.0067	.....	
20,000	20,000	.0071	.0003	
20,500	20,500	.0076	.....	
21,000	21,000	.0079	.....	Elastic limit.
21,500	21,500	.0086	.....	
22,000	22,000	.0101	.....	
22,500	22,500	.0128	.....	
23,000	23,000	.0179	.....	
23,500	23,500	.0213	.....	
24,000	24,000	.0255	.....	
24,500	24,500	.0304	.....	
25,000	25,000	.0398	.....	
26,000	26,000	.0548	.....	
27,000	27,000	.0700	.....	
28,000	28,000	.0878	.....	
29,000	29,000	.1188	.....	
30,000	30,000	.1420	.....	
31,000	31,000	.1650	.....	
32,000	32,000	.1975	.....	
33,000	33,000	.2280	.....	
34,000	34,000	.27	.....	
35,000	35,000	.29	.....	
36,000	36,000	.34	.....	
37,000	37,000	.38	.....	
38,000	38,000	.42	.....	
39,000	39,000	.48	.....	
40,000	40,000	.53	.....	
41,000	41,000	.60	.....	
42,000	42,000	.67	.....	Surface cracks open.
43,000	43,000	.76	.....	
44,000	44,000	.87	.....	
45,000	45,000	1.00	.....	
46,000	46,000	1.14	.....	
47,000	47,000	1.40	.....	
47,710	47,710	1.83	.....	Tensile strength.
0	0	1.98	.....	= 19.8 per cent.

Fractured 6″.50 from neck, and 9″.5 from outside end of specimen. Appearance, fibrous; trace of granulation; seamy.

Diameter at fracture, ″.97. Area, .739 square inch. Contraction, 26.1 per cent.

Elongation of inch sections, ″.13, ″.14, ″.14, ″.19, ″.34*, ″.25, ″.20, ″.19, ″.20, ″.20.

No. 1603.

Marks, $\frac{B \& P_1}{C_2}$.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	1,000	0.	0.	Initial load.
5,000	5,000	.0016	0.	
10,000	10,000	.0032	0.	
15,000	15,000	.0052	.0001	
18,000	18,000	.0033	.....	
19,000	19,000	.0037	.....	
20,000	20,000	.0073	.0004	Elastic limit.
20,500	20,500	.0081	.....	
21,000	21,000	.0088	.....	
21,500	21,500	.0100	.....	
22,000	22,000	.0119	.....	
22,500	22,500	.0143	.....	
23,000	23,000	.0177	.....	
23,500	23,500	.0228	.....	
24,000	24,000	.0270	.....	
24,500	24,500	.0330	.....	
25,000	25,000	.0395	.....	
26,000	26,000	.0512	.....	
27,000	27,000	.0695	.....	
28,000	28,000	.0910	.....	
29,000	29,000	.1155	.....	
30,000	30,000	.1435	.....	
31,000	31,000	.1725	.....	
32,000	32,000	.2045	.....	
33,000	33,000	.2380	.....	
34,000	34,000	.28	.....	
35,000	35,000	.33	.....	
36,000	36,000	.36	.....	
37,000	37,000	.40	.....	
38,000	38,000	.46	.....	
39,000	39,000	.52	.....	
40,000	40,000	.58	.....	
41,000	41,000	.65	.....	
42,000	42,000	.74	.....	
43,000	43,000	.84	.....	
44,000	44,000	.96	.....	
45,000	45,000	1.16	.....	Surface cracks open.
46,000	46,000	1.43	.....	
46,620	46,620	1.84	.....	Tensile strength.
0	0	1.97	.....	= 19.7 per cent.

Fractured 4″.25 from neck, and 13″ from outside end of specimen. Appearance, fibrous, 75 per cent.; granular, 25 per cent.; seamy.

Diameter at fracture, ″.97. Area, .739 square inch. Contraction, 26.1 per cent.

Elongation of inch sections, ″.15, ″.14, ″.14, ″.16, ″.15, ″.17, ″.19, ″.38*, ″.26, ″.23.

WROUGHT-IRON TENDER AXLE.

This axle fractured in service, causing derailment of train.

The fracture occurred inside the wheel seat, and from its appearance a part of the fracture was evidently an old one.

No. 1641.

Mark, 1.
Diameter, 1″.0092.
Sectional area, .80 square inch.
Gauged length, 6″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
800	1,000	0.	0.	Initial load.
4,000	5,000	.0008	0.	
8,000	10,000	.0018	0.	
12,000	15,000	.0030	.0001	
16,000	20,000	.0044	.....	
16,800	21,000	.0047	.....	
17,100	21,500	.0054	.....	
17,600	22,000	.0056	.....	Elastic limit.
18,000	22,500	.0068	.....	
18,400	23,000	.0090	.....	
19,200	24,000	.0155	.....	
20,000	25,000	.0225	.....	
20,800	26,000	.0320	.....	
21,600	27,000	.0400	.....	
22,400	28,000	.0530	.....	
23,200	29,000	.0667	.....	
24,000	30,000	.0811	.....	
24,800	31,000	.0968	.....	
25,600	32,000	.1128	.....	
26,400	33,000	.1317	.....	
27,200	34,000	.1517	.....	
28,000	35,000	.1750	.....	
28,800	36,000	.2025	.....	
29,600	37,000	.2270	.....	
30,400	38,000	.2600	.....	
31,200	39,000	.2950	.....	
32,000	40,000	.3380	.....	
32,800	41,000	.40	.....	
33,600	42,000	.47	.....	
34,400	43,000	.58	.....	
34,800	43,500	.....	.....	Tensile strength.
0	0	.78	.....	=13.0 per cent.

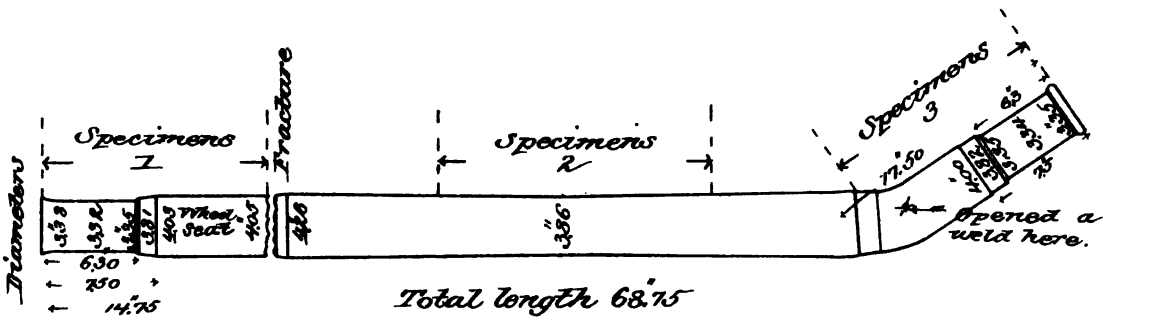
Fractured 4″ from neck. Appearance, granular, 90 per cent.; fibrous, 10 per cent. Opened cracks in surface of stem. Before the test the stem showed cinder marks on its surface.

Diameter at fracture, ″.92. Area, .665 square inch. Contraction, 16.9 per cent.

Elongation of inch sections, ″.09, ″.14, ″.11, ″.21*, ″.12, ″.10, ″.10, ″.13.

Wrought iron, R.R. tender axle.

Shape after fracture.



End view of the train.

of the fracture, which occurred in Section a was an old fracture, it had a smooth surface. Section b, new fracture it had a bright granular surface.

H Ex 45 50 2

No. 1642.

Mark, 1.
Diameter, 1″.0092.
Sectional area, .80 square inch.
Gauged length, 6″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
800	1,000	0.	0.	Initial load.
4,000	5,000	.0009	0.	
8,000	10,000	.0019	0.	
12,000	15,000	.0030	0.	
16,000	20,000	.0041	.0001	
16,800	21,000	.0043	.....	
17,600	22,000	.0047	.....	
18,400	23,000	.0051	.....	Elastic limit.
18,800	23,500	.0057	.....	
19,200	24,000	.0064	.....	
19,600	24,500	.0077	.....	
20,000	25,000	.0100	.....	
20,800	26,000	.0130	.....	
21,600	27,000	.0188	.....	
22,400	28,000	.0290	.....	
23,200	29,000	.0415	.....	
24,000	30,000	.0565	.....	
24,800	31,000	.0714	.....	
25,600	32,000	.0892	.....	
26,400	33,000	.1070	.....	
27,200	34,000	.1270	.....	
28,000	35,000	.1485	.....	
28,800	36,000	.1710	.....	
29,600	37,000	.1965	.....	
30,400	38,000	.2250	.....	
31,200	39,000	.26	.....	
32,000	40,000	.30	.....	
32,800	41,000	.33	.....	
33,600	42,000	.38	.....	
34,400	43,000	.43	.....	
35,200	44,000	.51	.....	
36,000	45,000	.60	.....	
36,800	46,000	.78	.....	
37,080	46,350	.89	.....	Tensile strength.
0	0	.98	.....	= 15.5 per cent.

Fractured 5″ from neck. Appearance, granular, 50 per cent.; fibrous, 50 per cent. Opened cracks in surface of stem.

Diameter at fracture, ″.91. Area, .650 square inch. Contraction, 18.8 per cent.

Elongation of inch sections, ″.13, ″.12, ″.13, ″.16, ″.24*, ″.16, ″.12, ″.09.

No. 1643.

Mark, 1.
Diameter, 1″.0092.
Sectional area, .80 square inch.
Gauged length, 6″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
800	1,000	0.	0.	Initial load.
4,000	5,000	.0009	0.	
8,000	10,000	.0018	0.	
12,000	15,000	.0030	.0001	
16,000	20,000	.0049	.0002	
16,800	21,000	.0046	.....	
17,200	21,500	.0051	.....	Elastic limit.
17,600	22,000	.0061	.....	
18,000	22,500	.0076	.....	
18,400	23,000	.0089	.....	
19,200	24,000	.0158	.....	
20,000	25,000	.0278	.....	
20,800	26,000	.0406	.....	
21,600	27,000	.0542	.....	
22,400	28,000	.0680	.....	
23,200	29,000	.0843	.....	
24,000	30,000	.1097	.....	
24,800	31,000	.1187	.....	
25,600	32,000	.1388	.....	
26,400	33,000	.1597	.....	
27,200	34,000	.1835	.....	
28,000	35,000	.2080	.....	
28,800	36,000	.30	.....	
29,600	37,000	.37	.....	
30,400	38,000	.41	.....	
31,200	39,000	.45	.....	
32,000	40,000	.51	.....	Surface cracks open in stem.
32,800	41,000	.60	.....	
33,600	42,000	.67	.....	
34,400	43,000	.73	.....	
35,200	44,000	.84	.....	
36,000	45,000	1.00	.....	
36,080	45,100	.....	.....	Tensile strength.
0	0	1.02	.....	= 18.2 per cent.

Fractured 4″ from the neck. Appearance, fibrous, slightly spongy. Diameter at fracture, ″.89. Area, .622 square inch. Contraction, 22.2 per cent.

Elongation of inch sections, ″.12, ″.12, ″.26*, ″.23*, ″.16, ″.15, ″.17, ″.14.

No. 1638.

Marks, 2.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	1,000	0.	0.	Initial load.
5,000	5,000	.0015	0.	
10,000	10,000	.0032	0.	
15,000	15,000	.0050	0.	
20,000	20,000	.0068	.....	
21,000	21,000	.0072	.....	
22,000	22,000	.0077	.....	
22,500	22,500	.0080	.....	
23,000	23,000	.0082	.....	Elastic limit.
23,500	23,500	.0096	.....	
24,000	24,000	.0104	.....	
25,000	25,000	.0131	.....	
26,000	26,000	.0238	.....	
27,000	27,000	.0558	.....	
28,000	28,000	.0780	.....	
29,000	29,000	.0998	.....	
30,000	30,000	.1245	.....	
31,000	31,000	.1500	.....	
32,000	32,000	.1775	.....	
33,000	33,000	.2085	.....	
34,000	34,000	.2400	.....	
35,000	35,000	.2760	.....	
36,000	36,000	.3140	.....	
37,000	37,000	.38	.....	
38,000	38,000	.43	.....	
39,000	39,000	.48	.....	
40,000	40,000	.53	.....	
41,000	41,000	.62	.....	
42,000	42,000	.70	.....	
43,000	43,000	.80	.....	
44,000	44,000	.92	.....	
45,000	45,000	1.12	.....	
46,000	46,000	1.40	.....	
46,760	46,760	2.03	.....	Tensile strength.
0	0	2.23	.....	=22.8 per cent.

Fractured at middle of stem. Appearance, fibrous; slightly granular.

Diameter at fracture, ″.92. Area, .665 square inch. Contraction, 33.5 per cent.

Elongation of inch sections, ″.22, ″.20, ″.20, ″.21, ″.37*, ″.31*, ″.21, ″.21, ″.18, ″.17.

No. 1639.

Marks, 2.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	1,000	0.	0.	Initial load.
5,000	5,000	.0015	0.	
10,000	10,000	.0033	0.	
15,000	15,000	.0056	.0005	
20,000	20,000	.0096	.0035	Elastic limit probably 19,000 ±.
20,500	20,500	.0110	.....	
21,000	21,000	.0116	.....	
21,500	21,500	.0126	.....	
22,000	22,000	.0135	.....	
23,000	23,000	.0159	.....	
24,000	24,000	.0198	.....	
25,000	25,000	.0280	.....	
26,000	26,000	.0398	.....	
27,000	27,000	.0585	.....	
28,000	28,000	.0798	.....	
29,000	29,000	.1022	.....	
30,000	30,000	.1280	.....	
31,000	31,000	.1550	.....	
32,000	32,000	.1830	.....	
33,000	33,000	.2130	.....	
34,000	34,000	.2460	.....	
35,000	35,000	.2820	.....	
36,000	36,000	.3230	.....	
37,000	37,000	.39	.....	
38,000	38,000	.43	.....	
39,000	39,000	.49	.....	
40,000	40,000	.54	.....	
41,000	41,000	.62	.....	
42,000	42,000	.69	.....	
43,000	43,000	.79	.....	
44,000	44,000	.91	.....	
45,000	45,000	1.07	.....	
46,000	46,000	1.27	.....	
47,000	47,000	1.71	.....	
47,150	47,150	2.00	.....	Tensile strength.
0	0	2.35	.....	= 23.5 per cent.

Fractured at middle of stem. Appearance, fibrous.

Diameter at fracture, ″.88. Area, .608 square inch. Contraction, 39.2 per cent.

Elongation of inch sections, ″.21, ″.20, ″.19, ″.21, ″.51*, ″.35, ″.20, ″.18, ″.17, ″.13.

No. 1640.

Marks, 2.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	1,000	0.	0.	Initial load.
5,000	5,000	.0015	0.	
10,000	10,000	.0032	0.	
15,000	15,000	.0055	.0007	
16,000	16,000	.0062	.....	
17,000	17,000	.0068	.....	
18,000	18,000	.0076	.....	
18,500	18,500	.0081	.....	Elastic limit.
19,000	19,000	.0087	.....	
19,500	19,500	.0096	.....	
20,000	20,000	.0103	.....	
21,000	21,000	.0115	.....	
22,000	22,000	.0131	.....	
23,000	23,000	.0161	.....	
24,000	24,000	.0198	.....	
25,000	25,000	.0280	.....	
26,000	26,000	.0385	.....	
27,000	27,000	.0538	.....	
28,000	28,000	.0760	.....	
29,000	29,000	.0965	.....	
30,000	30,000	.1210	.....	
31,000	31,000	.1485	.....	
32,000	32,000	.1780	.....	
33,000	33,000	.2115	.....	
34,000	34,000	.2440	.....	
35,000	35,000	.2830	.....	
36,000	36,000	.3250	.....	
37,000	37,000	.40	.....	
38,000	38,000	.44	.....	
39,000	39,000	.50	.....	
40,000	40,000	.57	.....	
41,000	41,000	.64	.....	
42,000	42,000	.74	.....	
43,000	43,000	.87	.....	
44,000	44,000	1.02	.....	
44,900	44,900	.....	.....	Tensile strength.
0	0	1.46	.....	=14.6 per cent.

Fractured 5″ from neck. Appearance, fibrous, seamy. Fractured in detail, separating first at one side.

Diameter at fracture, ″.91. Area, .650 square inch. Contraction, 35.0 per cent.

Elongation of inch sections, ″.10, ″.11, ″.19, ″.37*, ″.14, ″.12, ″.11, ″.10, ″.11, ″.11.

No. 1644.

Total length of specimen, 14″.
Marks, 3.
Diameter, 1″.0092.
Sectional area, .80 square inch.
Gauged length, 6″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
800	1,000	0.	0.	Initial load.
4,000	5,000	.0008	.....	
8,000	10,000	.0018	.....	
12,000	15,000	.0028	.....	
15,200	19,000	.0036	.....	
15,600	19,500	.0039	.....	Elastic limit.
16,000	20,000	.0065	.0027	
16,400	20,500	.0073	.....	
16,800	21,000	.0086	.....	
17,600	22,000	.0140	.....	
18,400	23,000	.0197	.....	
19,200	24,000	.0311	.....	
20,000	25,000	.0448	.....	
20,800	26,000	.0594	.....	
21,600	27,000	.0675	.....	
22,400	28,000	.0870	.....	
23,200	29,000	.1075	.....	
24,000	30,000	.1180	.....	
24,800	31,000	.1355	.....	
25,600	32,000	.1568	.....	
26,400	33,000	.1786	.....	
27,200	34,000	.2017	.....	
28,000	35,000	.2250	.....	
28,800	36,000	.26	.....	
29,600	37,000	.29	.....	
30,400	38,000	.33	.....	
31,200	39,000	.38	.....	Surface cracks open on stem.
32,000	40,000	.43	.....	
32,800	41,000	.50	.....	
33,600	42,000	.57	.....	
34,400	43,000	.68	.....	
35,200	44,000	.83	.....	
36,000	45,000	1.09	.....	
36,100	45,125	.....	.....	Tensile strength.
0	0	1.61	.....	=26.8 per cent.

Fractured 3″ from neck. Appearance, fibrous, lamellar.

Diameter at fracture, ″.81. Area, .515 square inch. Contraction, 35.6 per cent.

Elongation of inch sections, ″.10, ″.13, ″.16, ″.21, ″.25, ″.36, ″.50*, ″.22.

No. 1645.

Marks, 3.
Diameter, 1″.0092.
Sectional area, .80 square inch.
Gauged length, 6″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
800	1,000	0.	0.	Initial load.
4,000	5,000	.0008	0.	
8,000	10,000	.0018	0.	
12,000	15,000	.0028	0.	
13,600	17,000	.0033	.....	
14,400	18,000	.0035	.....	
15,200	19,000	.0037	.....	
15,600	19,500	.0039	.....	
16,000	20,000	.0040	.....	
16,400	20,500	.0041	.....	
16,800	21,000	.0042	.....	
17,200	21,500	.0045	.....	
17,600	22,000	.0047	.....	
18,000	22,500	.0049	.....	Elastic limit.
18,400	23,000	.0059	.....	
18,800	23,500	.0096	.....	
19,200	24,000	.0128	.....	
20,000	25,000	.0225	.....	
20,800	26,000	.0356	.....	
21,600	27,000	.0475	.....	
22,400	28,000	.0617	.....	
23,200	29,000	.0755	.....	
24,000	30,000	.0927	.....	
24,800	31,000	.1112	.....	
25,600	32,000	.1291	.....	
26,400	33,000	.1500	.....	
27,200	34,000	.1720	.....	
28,000	35,000	.1957	.....	
28,800	36,000	.2250	.....	
29,600	37,000	.2550	.....	
30,400	38,000	.2850	.....	
31,200	39,000	.3240	.....	
32,000	40,000	.37	.....	
32,800	41,000	.43	.....	
33,600	42,000	.50	.....	
34,400	43,000	.57	.....	
35,200	44,000	.68	.....	Surface cracks open.
36,000	45,000	.86	.....	
36,580	45,725	1.25	.....	Tensile strength.
0	0	1.33	.....	= 22.2 per cent.

Fractured 3″.4 from neck. Appearance, fibrous, 95 per cent.; granular, 5 per cent. Opened cracks in stem.

Diameter at fracture, ″.86. Area, .581 square inch. Contraction, 27.4 per cent.

Elongation of inch sections, ″.13, ″.14, ″.16, ″.19, ″.26, ″.35*, ″.23, ″.14.

No. 1646.

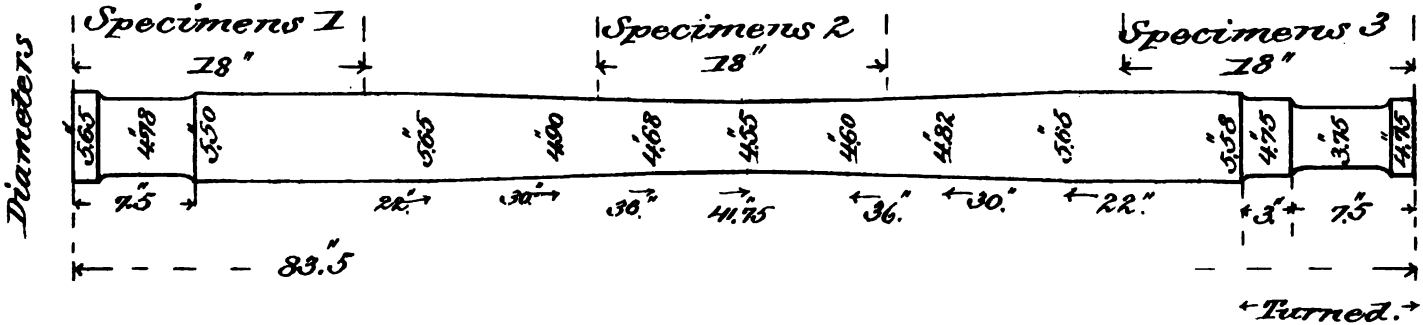
Marks, 3.
Diameter, 1″.0092.
Sectional area, .80 square inch.
Gauged length, 6″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
800	1,000	0.	0.	Initial load.
4,000	5,000	.0008	0.	
8,000	10,000	.0018	0.	
12,000	15,000	.0028	0.	
14,400	18,000	.0035	.....	
15,200	19,000	.0037	.....	
16,000	20,000	.0040	.....	
16,800	21,000	.0043	.....	
17,200	21,500	.0045	.....	
17,600	22,000	.0047 .0080	.....	Elastic limit.
18,000	22,500	.0120	.....	
18,400	23,000	.0150	.....	
19,200	24,000	.0245	.....	
20,000	25,000	.0367	.....	
20,800	26,000	.0490	.....	
21,600	27,000	.0613	.....	
22,400	28,000	.0762	.....	
23,200	29,000	.0917	.....	
24,000	30,000	.1090	.....	
24,800	31,000	.1267	.....	
25,600	32,000	.1458	.....	
26,400	33,000	.1658	.....	
27,200	34,000	.1880	.....	
28,000	35,000	.2150	.....	
28,800	36,000	.2410	.....	
29,600	37,000	.2680	.....	
30,400	38,000	.3000	.....	
31,200	39,000	.3400	.....	
32,000	40,000	.39	.....	
32,800	41,000	.43	.....	
33,600	42,000	.50	.....	
34,400	43,000	.58	.....	
35,200	44,000	.68	.....	
36,000	45,000	.83	.....	
36,680	45,850	1.19	.....	Tensile strength.
0	0	1.36	.....	= 22.7 per cent.

Fractured 3″ from the neck. Appearance, fibrous.
Diameter at fracture, ″.82. Area, .528 square inch. Contraction, 34.0 per cent.
Elongation of inch sections, ″.21, ″.18, ″.15, ″.15, ″.18, ″.24, ″.46*, ″.19.

Fagoted wrought iron R.R. tender axle.

Branded, JO Patent shaft & Axletree Co. Trim. 87



H Ex 45 50 2

Dimensions of forging.

FAGOTED WROUGHT-IRON TENDER AXLE.

Manufactured by the Patent Shaft and Axletree Company of Wednesbury, England.

This axle was made by welding eight fagot bars to a central bar of about 1⅞ inches diameter.

No. 1613.

Mark, 1.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	1,000	0.	0.	Initial load.
5,000	5,000	.0016	0	
10,000	10,000	.0033	0.	
15,000	15,000	.0050	.0001	
18,000	18,000	.0061	.....	
19,000	19,000	.0066	.....	
19,500	19,500	.0070	.....	
20,000	20,000	.0074 .0213	.0144	Elastic limit.
20,500	20,500	.0235	.....	
21,000	21,000	.0280	.....	
21,500	21,500	.0346	.....	
22,000	22,000	.0397	.....	
23,000	23,000	.0570	.....	
24,000	24,000	.0700	.....	
25,000	25,000	.0950	.....	
26,000	26,000	.1270	.....	
27,000	27,000	.1620	.....	
28,000	28,000	.1885	.1778	
.....	1,000	.1778	.....	
.....	5,000	.1792	.....	
.....	10,000	.1811	.....	
.....	15,000	.1830	.....	
.....	20,000	.1851	.....	
.....	1,000	.1778	.....	
29,000	29,000	.2080	.....	
30,000	30,000	.2430	.....	
31,000	31,000	.29	.....	
32,000	32,000	.33	.....	
33,000	33,000	.37	.....	
34,000	34,000	.41	.....	
35,000	35,000	.47	.....	
36,000	36,000	.51	.....	
37,000	37,000	.57	.....	
38,000	38,000	.64	.....	
39,000	39,000	.71	.....	
40,000	40,000	.80	.....	
41,000	41,000	.90	.....	
42,000	42,000	1.04	.....	
43,000	43,000	1.26	.....	
44,000	44,000	1.46	.....	
45,000	45,000	2.06	.....	
45,070	45,070	2.38	.....	Tensile strength.
0	0	2.74	.....	=27.4 per cent.

Fractured 11″ from end of axle. Appearance, fibrous; trace of granulation.

Diameter at fracture, ″.87. Area, .594 square inch. Contraction, 40.6 per cent.

Elongation of inch sections, ″.18, ″.18, ″.22, ″.22, ″.24, ″.27, ″.42, ″.51,* ″.26, ″.24.

No. 1614.

Mark, 1.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	1,000	0.	0.	Initial load.
5,000	5,000	.0013	0.	
10,000	10,000	.0031	0.	
15,000	15,000	.0049	0.	
18,000	18,000	.0060	.....	
19,000	19,000	.0067	.....	
19,500	19,500	.0071	.....	Elastic limit.
20,000	20,000	.0205	.....	
20,500	20,500	.0270	.....	
21,000	21,000	.0320	.....	
21,500	21,500	.0375	.....	
22,000	22,000	.0490	.....	
23,000	23,000	.0630	.....	
24,000	24,000	.0780	.....	
25,000	25,000	.0980	.....	
26,000	26,000	.1180	.....	
27,000	27,000	.1450	.....	
28,000	28,000	.2020	.....	
29,000	29,000	.2330	.....	
30,000	30,000	.2580	.....	
31,000	31,000	.32	.....	
32,000	32,000	.36	.....	
33,000	33,000	.40	.....	
34,000	34,000	.45	.....	
35,000	35,000	.50	.....	
36,000	36,000	.56	.....	
37,000	37,000	.61	.....	
38,000	38,000	.68	.....	
39,000	39,000	.77	.....	
40,000	40,000	.88	.....	
41,000	41,000	1.01	.....	
42,000	42,000	1.17	.....	
43,000	43,000	1.40	.....	
44,000	44,000	1.89	.....	
44,100	44,100	2.23	.....	Tensile strength.
0	0	2.75	.....	= 27.5 per cent.

Fractured 11″ from end of axle. Appearance, fibrous.
Diameter at fracture, ″.89. Area, .622 square inch. Contraction, 37.8 per cent.
Elongation of inch sections, ″.18, ″.19, ″.20, ″.24, ″.29, ″.26, ″.35, ″.50*, ″.28, ″.26.

No. 1615.

Mark, 1.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	1,000	0.	0.	Initial load.
5,000	5,000	.0015	0.	
10,000	10,000	.0032	0.	
15,000	15,000	.0050	0.	
18,000	18,000	.0062	.....	
19,000	19,000	.0068	.....	
19,500	19,500	.0075	.....	Elastic limit.
19,600	19,600	.0110	.....	
19,800	19,800	.0136	.....	
20,000	20,000	.0160	.....	
20,500	20,500	.0202	.....	
21,000	21,000	.0250	.....	
22,000	22,000	.0340	.....	
23,000	23,000	.0480	.....	
24,000	24,000	.0640	.....	
25,000	25,000	.0830	.....	
26,000	26,000	.1040	.....	
27,000	27,000	.1330	.....	
28,000	28,600	.1730	.....	
29,000	29,000	.2010	.....	
30,000	30,000	.2380	.....	
31,000	31,000	.29	.....	
32,000	32,000	.32	.....	
33,000	33,000	.37	.....	
34,000	34,000	.40	.....	
35,000	35,000	.46	.....	
36,000	36,000	.50	.....	
37,000	37,000	.56	.....	
38,000	38,000	.63	.....	
39,000	39,000	.70	.....	
40,000	40,000	.80	.....	
41,000	41,000	.90	.....	
42,000	42,000	1.05	.....	
43,000	43,000	1.24	.....	
44,000	44,000	1.50	.....	
44,830	44,830	2.03	.....	Tensile strength.
0	0	2.20	.....	= 22.0 per cent.

Fractured 6″ from end of axle. Appearance, fibrous, in part oblique following weld.

Diameter at fracture, ″.93. Area, .679 square inch. Contraction, 32.1 per cent.

Elongation of inch sections, ″.19, ″.15, ″.49*, ″.21, ″.17, ″.19, ″.19, ″.20, ″.21, ″.20.

No. 1616.

Marks, 2.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	1,000	0.	0.	Initial load.
5,000	5,000	.0014	.....	
10,000	10,000	.0031	.....	
15,000	15,000	.0050	.....	
18,000	18,000	.0060	.....	
20,000	20,000	.0068	.....	
23,000	23,000	.0080	.....	
23,500	23,500	.0083	.....	
24,000	24,000	.0087	.....	Elastic limit.
24,500	24,500	.0137	.....	
25,000	25,000	.0155	.....	
25,500	25,500	.0298	.....	
26,000	26,000	.0353	.....	
27,000	27,000	.0455	.....	
28,000	28,000	.0640	.....	
29,000	29,000	.1130	.....	
30,000	30,000	.1400	.....	
31,000	31,000	.1850	.....	
32,000	32,000	.2150	.....	
33,000	33,000	.2470	.....	
34,000	34,000	.2860	.....	
35,000	35,000	.35	.....	
36,000	36,000	.40	.....	
37,000	37,000	.46	.....	
38,000	38,000	.51	.....	
39,000	39,000	.60	.....	
40,000	40,000	.68	.....	
41,000	41,000	.78	.....	
42,000	42,000	.90	.....	
43,000	43,000	1.10	.....	
44,000	44,000	1.40	.....	
44,290	44,290	1.70	.....	Tensile strength.
0	0	2.11	.....	=21.1 per cent.

Fractured 3″.75 from neck of specimen. Appearance, fibrous.

Diameter at fracture, ″.84. Area, .554 square inch. Contraction, 44.6 per cent.

Elongation of inch sections, ″.11, ″.12, ″.12, ″.12, ″.13, ″.15, ″.20, ″.41, ″.52*, ″.23.

No. 1617.

Marks, 2.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 10.″

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	1,000	0.	0.	Initial load.
5,000	5,000	.0015	0.	
10,000	10,000	.0032	0.	
15,000	15,000	.0050	0.	
20,000	20,000	.0068	0.	
23,000	23,000	.0080	.....	
23,500	23,500	.0082 .0106	.....	Elastic limit.
24,000	24,000	.0118	.....	
24,500	24,500	.0150	.....	
25,000	25,000	.0178	.....	
26,000	26,000	.0252	.....	
27,000	27,000	.0360	.....	
28,000	28,000	.0470	.....	
29,000	29,000	.0630	.....	
30,000	30,000	.0830	.....	
31,000	31,000	.1200	.....	
32,000	32,000	.1740	.....	
33,000	33,000	.2320	.....	
34,000	34,000	.2760	.....	
35,000	35,000	.32	.....	
36,000	36,000	.38	.....	
37,000	37,000	.42	.....	
38,000	38,000	.49	.....	
39,000	39,000	.56	.....	
40,000	40,000	.62	.....	
41,000	41,000	.71	.....	
42,000	42,000	.84	.....	
43,000	43,000	.99	.....	
44,000	44,000	1.20	.....	
44,910	44,910	1.78	.....	Tensile strength.
0	0	2.14	.....	=21.4 per cent.

Fractured 8″ from neck. Appearance, fibrous.

Diameter at fracture, ″.84. Area, .554 square inch. Contraction, 44.6 per cent.

Elongation of inch sections, ″.12, ″.13, ″.13, ″.11, ″.13, ″.15, ″.20, ″.29, ″.58*, ″.30.

No. 1618.

Marks, 2.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	1,000	0.	0.	Initial load.
5,000	5,000	.0013	0.	
10,000	10,000	.0030	0.	
15,000	15,000	.0048	0.	
20,000	20,000	.0066	0.	
23,000	23,000	.0078	.....	
23,500	23,500	.0082 .0107	.....	Elastic limit.
24,000	24,000	.0123	.....	
24,500	24,500	.0140	.....	
25,000	25,000	.0165	.....	
26,000	26,000	.0270	.....	
27,000	27,000	.0380	.....	
28,000	28,000	.0520	.....	
29,000	29,000	.0720	.....	
30,000	30,000	.0990	.....	
31,000	31,000	.1300	.....	
32,000	32,000	.2140	.....	
33,000	33,000	.2390	.....	
34,000	34,000	.2740	.....	
35,000	35,000	.33	.....	
36,000	36,000	.38	.....	
37,000	37,000	.42	.....	
38,000	38,000	.48	.....	
39,000	39,000	.55	.....	
40,000	40,000	.63	.....	
41,000	41,000	.71	.....	
42,000	42,000	.82	.....	
43,000	43,000	.97	.....	
44,000	44,000	1.20	.....	
44,860	44,860	1.75	.....	Tensile strength.
0	0	2.10	.....	= 21.0 per cent.

Fractured 4″.2 from neck. Appearance, fibrous.

Diameter at fracture, ″.85. Area, .567 square inch. Contraction, 43.3 per cent.

Elongation of inch sections, ″.11, ″.14, ″.12, ″.12, ″.11, ″.15, ″.22, ″.53*, ″.34, ″.26.

No. 1619.

Marks, 3.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	1,000	0.	0.	Initial load.
5,000	5,000	.0014	0.	
10,000	10,000	.0032	0.	
15,000	15,000	.0050	0.	
18,000	18,000	.0061	.....	
18,500	18,500	.0063	.....	
19,000	19,000	.0065	.....	
19,500	19,500	.0068	.....	
20,000	20,000	.0071	.....	
20,500	20,500	.0073	.....	
21,000	21,000	.0076	.....	
21,500	21,500	.0079	.....	
22,000	22,000	.0081	.....	
22,500	22,500	.0086	.....	
23,000	23,000	.0091	.....	
23,500	23,500	.0096	.....	Elastic limit.
24,000	24,000	.0103	.....	
24,500	24,500	.0110	.....	
25,000	25,000	.0135	.....	
25,500	25,500	.0220	.....	
26,000	26,000	.0300	.....	
27,000	27,000	.0520	.....	
28,000	28,000	.0830	.....	
29,000	29,000	.1250	.....	
30,000	30,000	.1570	.....	
31,000	31,000	.1810	.....	
32,000	32,000	.2110	.....	
33,000	33,000	.2410	.....	
34,000	34,000	.30	.....	
35,000	35,000	.34	.....	
36,000	36,000	.39	.....	
37,000	37,000	.42	.....	
38,000	38,000	.47	.....	
39,000	39,000	.52	.....	
40,000	40,000	.59	.....	
41,000	41,000	.66	.....	
42,000	42,000	.74	.....	
43,000	43,000	.85	.....	
44,000	44,000	.96	.....	
45,000	45,000	1.12	.....	
46,000	46,000	1.34	.....	
47,000	47,000	1.67	.....	
47,380	47,380	2.21	.....	Tensile strength.
0	0	2.54	.....	= 25.4 per cent.

Fractured 13″ from the end of the axle. Appearance, fibrous, 90 per cent.; granular, 10 per cent.

Diameter at fracture, ″.89. Area, .622 square inch. Contraction, 37.8 per cent.

Elongation of inch sections, ″.18, ″.18, ″.20, ″.19, ″.21, ″.20, ″.23, ″.26, ″.47*, ″.42*.

No. 1620.

Marks, 3.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	1,000	0.	0.	Initial load.
5,000	5,000	.0014	0.	
10,000	10,000	.0032	0.	
15,000	15,000	.0050	0.	
18,000	18,000	.0061	0.	
20,000	20,000	.0069	0.	
21,000	21,000	.0072	.....	
21,500	21,500	.0075	.....	
22,000	22,000	.0078	.....	
22,500	22,500	.0080	.....	
23,000	23,000	.0084	.....	
23,500	23,500	.0088	.....	
24,000	24,000	.0091	.....	
24,500	24,500	.0094	.....	
25,000	25,000	.0098	.....	Elastic limit.
25,500	25,500	.0106	.....	
26,000	26,000	.0111	.....	
26,500	26,500	.0119	.....	
27,000	27,000	.0380	.....	
28,000	28,000	.0610	.....	
29,000	29,000	.0950	.....	
30,000	30,000	.1230	.....	
31,000	31,000	.1690	.....	
32,000	32,000	.2070	.....	
33,000	33,000	.2370	.....	
34,000	34,000	.2680	.....	
35,000	35,000	.32	.....	
36,000	36,000	.37	.....	
37,000	37,000	.40	.....	
38,000	38,000	.45	.....	
39,000	39,000	.50	.....	
40,000	40,000	.57	.....	
41,000	41,000	.63	.....	
42,000	42,000	.72	.....	
43,000	43,000	.80	.....	
44,000	44,000	.92	.....	
45,000	45,000	1.09	.....	
46,000	46,000	1.30	.....	
47,000	47,000	1.77	.....	
47,090	47,090	1.95	.....	Tensile strength.
0	0	2.34	.....	=23.4 per cent.

Fractured 13″.5 from end of axle. Appearance, fibrous; interspersed with granular metal.

Diameter at fracture, ″.88. Area, .608 square inch. Contraction, 39.2 per cent.

Elongation of inch sections, ″.18, ″.17, ″.19, ″.19, ″.18, ″.19, ″.23, ″.24, ″.25, ″.52*.

No. 1621.

Marks, 3.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	1,000	0.	0.	Initial load.
5,000	5,000	.0014	0.	
10,000	10,000	.0031	0.	
15,000	15,000	.0048	0.	
18,000	18,000	.0060	0.	
20,000	20,000	.0067	.0001	
21,000	21,000	.0072	.....	
21,500	21,500	.0076	.....	
22,000	22,000	.0079	.....	
22,500	22,500	.0081	.....	
23,000	23,000	.0085	.....	
23,500	23,500	.0090	.....	
24,000	24,000	.0095 .0102	.....	Elastic limit.
24,500	24,500	.0111	.....	
25,000	25,000	.0119	.....	
25,500	25,500	.0165	Differences.	
26,000	26,000	.0235	.....	Immediate elongation.
.....	.....	.0391	.0156	After sustaining load 1 minute.
.....	.....	.0560	.0169	After sustaining load 2 minutes.
.....	.....	.0738	.0178	After sustaining load 3 minutes.
.....	.....	.0836	.0098	After sustaining load 4 minutes.
.....	.....	.0865	.0029	After sustaining load 5 minutes.
.....	.....	.0880	.0015	After sustaining load 6 minutes.
.....	.....	.0888	.0008	After sustaining load 7 minutes.
.....	.....	.0896	.0008	After sustaining load 8 minutes.
.....	.....	.0900	.0004	After sustaining load 9 minutes.
.....	.....	.0903	.0003	After sustaining load 10 minutes.
.....	.....	.0905	.0002	After sustaining load 11 minutes.
.....	.....	.0908	.0003	After sustaining load 12 minutes.
.....	.....	.0911	.0003	After sustaining load 13 minutes.
.....	.....	.0912	.0001	After sustaining load 14 minutes.
.....	.....	.0912	0.	After sustaining load 15 minutes.
.....	.....	.0913	.0001	After sustaining load 16 minutes.
.....	.....	.0914	.0001	After sustaining load 17 minutes.
.....	.....	.0914	0.	After sustaining load 18 minutes.
.....	.....	.0915	.0001	After sustaining load 19 minutes.
.....	.....	.0916	.0001	After sustaining load 20 minutes.
27,000	27,000	.0921	.....	
28,000	28,000	.1060	.....	
29,000	29,000	.1495	.....	
30,000	30,000	.1735	.....	
31,000	31,000	.2040	.....	
32,000	32,000	.2320	.....	
33,000	33,000	.2600	.....	
34,000	34,000	.32	.....	
35,000	35,000	.35	.....	
36,000	36,000	.39	.....	
37,000	37,000	.43	.....	
38,000	38,000	.49	.....	
39,000	39,000	.55	.....	
40,000	40,000	.62	.....	
41,000	41,000	.70	.....	
42,000	42,000	.77	.....	
43,000	43,000	.90	.....	
44,000	44,000	1.01	.....	
45,000	45,000	1.19	.....	
46,000	46,000	1.41	.....	
46,930	46,930	2.17	.....	Tensile strength.
0	0	2.71	.....	= 27.1 per cent.

Fractured 7″ from end of axle. Appearance, fibrous.

Diameter at fracture, ″.86. Area, .581 square inch. Contraction, 41.9 per cent.

Elongation of inch sections, ″.27, ″.29, ″.37, ″.50*, ″.24, ″.21, ″.21, ″.21, ″.22, ″.19.

No. 1622.

Mark, 1.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	1,000	0.	0.	Initial load.
5,000	5,000	.0014	0.	
10,000	10,000	.0031	0.	
15,000	15,000	.0049	0.	
18,000	18,000	.0061	.....	
19,000	19,000	.0069	.....	
19,500	19,500	.0071	.....	Elastic limit.
20,000	20,000	.0288	.....	
20,500	20,500	.0324	.....	
21,000	21,000	.0385	.....	
22,000	22,000	.0476	.....	
23,000	23,000	.0575	.....	
24,000	24,000	.0675	.....	
25,000	25,000	.0920	.....	
26,000	26,000	.1135	.....	
27,000	27,000	.1460	.....	
28,000	28,000	.1660	.....	
29,000	29,000	.1842	.....	
30,000	30,000	.2000	.....	
31,000	31,000	.2210	.....	
32,000	32,000	.2450	.....	
33,000	33,000	.2675	.....	
34,000	34,000	.30	.....	
35,000	35,000	.34	.....	
36,000	36,000	.37	.....	
37,000	37,000	.41	.....	
38,000	38,000	.45	.....	
39,000	39,000	.49	.....	
40,000	40,000	.53	.....	
41,000	41,000	.57	.....	
42,000	42,000	.63	.....	
43,000	43,000	.71	.....	
44,000	44,000	.77	.....	
45,000	45,000	.87	.....	
46,000	46,000	1.00	.....	
47,000	47,000	1.13	.....	
48,000	48,000	1.33	.....	
49,000	49,000	1.62	.....	
49,580	49,580	2.16	.....	Tensile strength.
0	0	2.91	.....	=29.1 per cent.

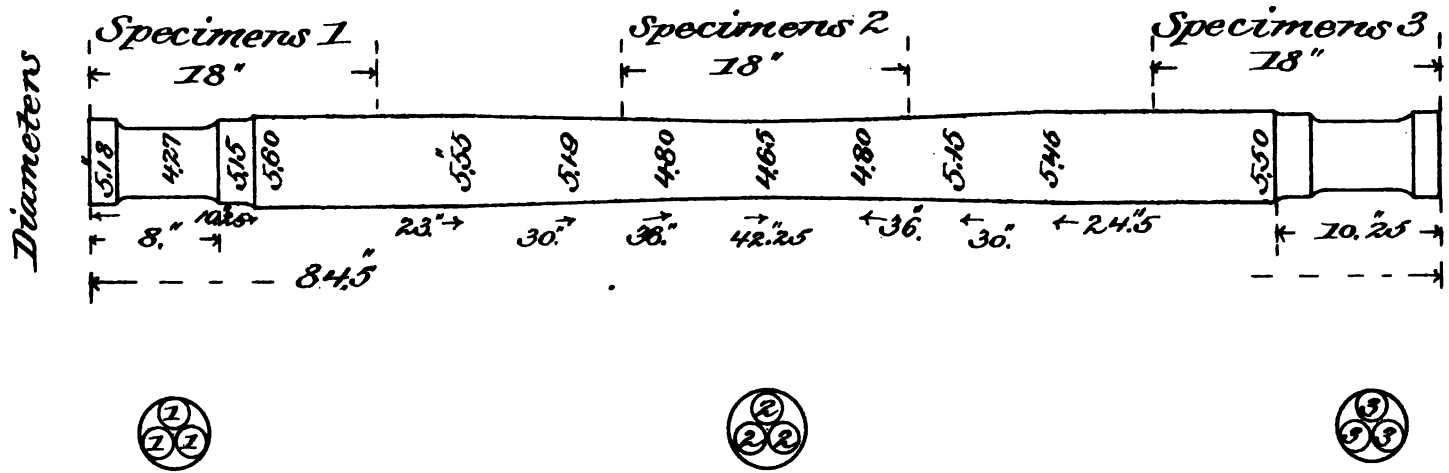
Fractured 9″ from end of axle. Appearance, fibrous.

Diameter at fracture, ″.80. Area, .503 square inch. Contraction, 49.7 per cent.

Elongation of inch sections, ″.21, ″.21, ″.21, ″.29, ″.63*, ″.38, ″.28, ″.23, ″.23, ″.24.

Swedish iron R.R. tender axle.

Branded, Surahb.



H Ex 45 50 2

No. 1624.

Mark, 1.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	1,000	0.	0.	Initial load.
5,000	5,000	.0014	0.	
10,000	10,000	.0032	0.	
15,000	15,000	.0049	.0001	
18,000	18,000	.0061	.....	
18,500	18,500	.0064	.....	Elastic limit.
19,000	19,000	.0078	.....	
		.0130	.....	
19,500	19,500	.0328	.....	
20,000	20,000	.0385	.....	
21,000	21,000	.0498	.....	
22,000	22,000	.0620	.....	
23,000	23,000	.0785	.....	
24,000	24,000	.0936	.....	
25,000	25,000	.1180	.....	
26,000	26,000	.1587	.....	
27,000	27,000	.1775	.....	
28,000	28,000	.1920	.....	
29,000	29,000	.2130	.....	
30,000	30,000	.2350	.....	
31,000	31,000	.2565	.....	
32,000	32,000	.2840	.....	
33,000	33,000	.31	.....	
34,000	34,000	.35	.....	
35,000	35,000	.39	.....	
36,000	36,000	.43	.....	
37,000	37,000	.47	.....	
38,000	38,000	.51	.....	
39,000	39,000	.55	.....	
40,000	40,000	.61	.....	
41,000	41,000	.68	.....	
42,000	42,000	.75	.....	
43,000	43,000	.83	.....	
44,000	44,000	.93	.....	
45,000	45,000	1.07	.....	
46,000	46,000	1.26	.....	
47,000	47,000	1.62	.....	
47,490	47,490	1.96	.....	Tensile strength.
40,800	40,800	.....	.....	Load at time of rupture.
0	0	2.56	.....	= 25.6 per cent.

Fractured 9½″ from end of axle. Appearance, fibrous.

Diameter at fracture, ″.79. Area, .490 square inch. Contraction, 51.0 per cent.

Elongation of inch sections, ″.22, ″.20, ″.24, ″.34, ″.66*, ″.27, ″.21, ″.16, ″.14, ″.12.

No. 1625.

Mark, 1.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	1,000	0.	0.	Initial load.
5,000	5,000	.0015	0.	
10,000	10,000	.0031	0.	
15,000	15,000	.0050	.0001	
18,000	18,000	.0061	.....	
18,500	18,500	.0066 .0250	.....	Elastic limit.
19,000	19,000	.0273	.....	
19,500	19,500	.0313	.....	
20,000	20,000	.0356	.....	
21,000	21,000	.0448	.....	
22,000	22,000	.0580	.....	
23,000	23,000	.0685	.....	
24,000	24,000	.0811	.....	
25,000	25,000	.0935	.....	
26,000	26,000	.1100	.....	
27,000	27,000	.1840	.....	
28,000	28,000	.2040	.....	
29,000	29,000	.2270	.....	
30,000	30,000	.2468	.....	
31,000	31,000	.2750	.....	
32,000	32,000	.2985	.....	
33,000	33,000	.33	.....	
34,000	34,000	.37	.....	
35,000	35,000	.41	.....	
36,000	36,000	.45	.....	
37,000	37,000	.50	.....	
38,000	38,000	.53	.....	
39,000	39,000	.59	.....	
40,000	40,000	.67	.....	
41,000	41,000	.74	.....	
42,000	42,000	.83	.....	
43,000	43,000	.94	.....	
44,000	44,000	1.09	.....	
45,000	45,000	1.27	.....	
46,000	46,000	1.53	.....	
46,720	46,720	2.01	.....	Tensile strength.
0	0	2.47	.....	= 24.7 per cent.

Fractured 4½″ from end of axle. Appearance, fibrous.

Diameter at fracture, ″.73. Area, .419 square inch. Contraction, 58.1 per cent.

Elongation of inch sections, ″.72*, ″.26, ″.21, ″.23, ″.24, ″.20, ″.18, ″.16, ″.14, ″.13.

No. 1623.

Marks, 2.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	1,000	0.	0.	Initial load.
5,000	5,000	.0013	0.	
10,000	10,000	.0030	0.	
15,000	15,000	.0046	0.	
18,000	18,000	.0059	.....	
18,500	18,500	.0062	.....	
19,000	19,000	.0065 .0111	.....	Elastic limit.
19,500	19,500	.0131	.....	
20,000	20,000	.0152	.....	
21,000	21,000	.0285	.....	
22,000	22,000	.0405	.....	
23,000	23,000	.0470	.....	
24,000	24,000	.0550	.....	
25,000	25,000	.0815	.....	
26,000	26,000	.1015	.....	
27,000	27,000	.1200	.....	
28,000	28,000	.1410	.....	
29,000	29,000	.1700	.....	
30,000	30,000	.1940	.....	
31,000	31,000	.2130	.....	
32,000	32,000	.2340	.....	
33,000	33,000	.2575	.....	
34,000	34,000	.2830	.....	
35,000	35,000	.3060	.....	
36,000	36,000	.34	.....	
37,000	37,000	.38	.....	
38,000	38,000	.43	.....	
39,000	39,000	.47	.....	
40,000	40,000	.51	.....	
41,000	41,000	.56	.....	
42,000	42,000	.61	.....	
43,000	43,000	.68	.....	
44,000	44,000	.76	.....	
45,000	45,000	.86	.....	
46,000	46,000	.98	.....	
47,000	47,000	1.10	.....	
48,000	48,000	1.33	.....	
48,720	48,720	1.68	.....	Tensile strength.
0	0	2.30	.....	= 23.0 per cent.

Fractured 5½″ from the neck. Appearance, fibrous.

Diameter at fracture, ″.77. Area, .466 square inch. Contraction, 53.4 per cent.

Elongation of inch sections, ″.18, ″.25, ″.30, ″.69*, ″.24, ″.14, ″.13, ″.12, ″.12, ″.13.

No. 1626.

Marks 2.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	1,000	0.	0.	nitial load.
5,000	5,000	.0014	0.	
10,000	10,000	.0031	0.	
15,000	15,000	.0048	0.	
18,000	18,000	.0060	.....	
18,500	18,500	.0062	.....	
19,000	19,000	.0065	.....	
19,500	19,500	.0069	.....	
20,000	20,000	.0072	.....	Elastic limit.
20,500	20,500	.0108	.....	
21,000	21,000	.0135	.....	
21,500	21,500	.0170	.....	
22,000	22,000	.0324	.....	
23,000	23,000	.0445	.....	
24,000	24,000	.0535	.....	
25,000	25,000	.0690	.....	
26,000	26,000	.0820	.....	
27,000	27,000	.0995	.....	
28,000	28,000	.1176	.....	
29,000	29,000	.1350	.....	
30,000	30,000	.1550	.....	
31,000	31,000	.1865	.....	
32,000	32,000	.2085	.....	
33,000	33,000	.2278	.....	
34,000	34,000	.2467	.....	
35,000	35,000	.2670	.....	
36,000	36,000	.2930	.....	
37,000	37,000	.33	.....	
38,000	38,000	.37	.....	
39,000	39,000	.41	.....	
40,000	40,000	.43	.....	
41,000	41,000	.47	.....	
42,000	42,000	.52	.....	
43,000	43,000	.57	.....	
44,000	44,000	.62	.....	
45,000	45,000	.69	.....	
46,000	46,000	.76	.....	
47,000	47,000	.84	.....	
48,000	48,000	.94	.....	
49,000	49,000	1.09	.....	
50,000	50,000	1.32	.....	
50,920	50,920	1.88	.....	Tensile strength.
0	0	2.25	.....	= 22.5 per cent.

Fractured 6″ from the neck. Appearance, fibrous.

Diameter at fracture, ″.80. Area, .503 square inch. Contraction, 49.7 per cent.

Elongation of inch sections, ″.17, ″.17, ″.20, ″.57*, ″.26, ″.15, ″.15, ″.15, ″.21, ″.22.

No. 1627.

Marks, 2.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	1,000	0.	0.	Initial load.
5,000	5,000	.0016	0.	
10,000	10,000	.0033	0.	
15,000	15,000	.0051	0.	
18,000	18,000	.0062	.....	
18,500	18,500	.0066	.....	
19,000	19,000	.0070	.....	
19,500	19,500	.0075	.....	Elastic limit.
20,000	20,000	.0088	.....	
		.0130	.....	
21,000	21,000	.0186	.....	
22,000	22,000	.0310	.....	
23,000	23,000	.0540	.....	
24,000	24,000	.0726	.....	
25,000	25,000	.0882	.....	
26,000	26,000	.1065	.....	
27,000	27,000	.1330	.....	
28,000	28,000	.1650	.....	
29,000	29,000	.1825	.....	
30,000	30,000	.2035	.....	
31,000	31,000	.2260	.....	
32,000	32,000	.2460	.....	
33,000	33,000	.2715	.....	
34,000	34,000	.2985	.....	
35,000	35,000	.3270	.....	
36,000	36,000	.38	.....	
37,000	37,000	.41	.....	
38,000	38,000	.44	.....	
39,000	39,000	.50	.....	
40,000	40,000	.53	.....	
41,000	41,000	.58	.....	
42,000	42,000	.63	.....	
43,000	43,000	.71	.....	
44,000	44,000	.80	.....	
45,000	45,000	.90	.....	
46,000	46,000	1.03	.....	
47,000	47,000	1.20	.....	
48,000	48,000	1.46	.....	
48,590	48,590	1.91	.....	Tensile strength.
0	0	2.29	.....	=22.9 per cent.

Fractured 6″.4 from neck. Appearance, fibrous.

Diameter at fracture, ″.76. Area, .454 square inch. Contraction, 54.6 per cent.

Elongation of inch sections, ″.19, ″.20, ″.20, ″.34, ″.58*, ″.19, ″.17, ″.15, ″.14, ″.13.

No. 1628.

Marks, 3.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	1,000	0.	0.	Initial load.
5,000	5,000	.0014	0.	
10,000	10,000	.0030	0.	
15,000	15,000	.0049	.0001	
17,500	17,500	.0058	.....	Elastic limit.
18,000	18,000	.0125	.....	
18,500	18,500	.0331	.....	
19,000	19,000	.0362	.....	
19,500	19,500	.0405	.....	
20,000	20,000	.0460	.....	
21,000	21,000	.0597	.....	
22,000	22,000	.0715	.....	
23,000	23,000	.0890	.....	
24,000	24,000	.1100	.....	
25,000	25,000	.1240	.....	
26,000	26,000	.1375	.....	
27,000	27,000	.1570	.....	
28,000	28,000	.1741	.....	
29,000	29,000	.1925	.....	
30,000	30,000	.2150	.....	
31,000	31,000	.2350	.....	
32,000	32,000	.2590	.....	
33,000	33,000	.2840	.....	
34,000	34,000	.3150	.....	
35,000	35,000	.34	.....	
36,000	36,000	.39	.....	
37,000	37,000	.43	.....	
38,000	38,000	.46	.....	
39,000	39,000	.50	.....	
40,000	40,000	.54	.....	
41,000	41,000	.60	.....	
42,000	42,000	.67	.....	
43,000	43,000	.74	.....	
44,000	44,000	.85	.....	
45,000	45,000	.95	.....	
46,000	46,000	1.09	.....	
47,000	47,000	1.32	.....	
47,610	47,610	1.69	.....	Tensile strength.
0	0	2.14	.....	= 21.4 per cent.

Fractured 9½″ from end of axle. Appearance, fibrous.
Diameter at fracture, ″.73. Area, .419 square inch. Contraction, 58.1 per cent.
Elongation of inch sections, ″.16, ″.16, ″.16, ″.22, ″.69*, ″.29, ″.13, ″.11, ″.11, ″.11.

No. 1629.

Marks, 3.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	1,000	0.	0.	Initial load.
5,000	5,000	.0015	0.	
10,000	10,000	.0031	0.	
15,000	15,000	.0049	.0001	
17,500	17,500	.0063	.....	Elastic limit.
18,000	18,000	.0217	.....	
18,500	18,500	.0319	.....	
19,000	19,000	.0395	.....	
20,000	20,000	.0431	.....	
21,000	21,000	.0500	.....	
22,000	22,000	.0585	.....	
23,000	23,000	.0702	.....	
24,000	24,000	.0885	.....	
25,000	25,000	.1150	.....	
26,000	26,000	.1420	.....	
27,000	27,000	.1600	.....	
28,000	28,000	.1775	.....	
29,000	29,000	.1980	.....	
30,000	30,000	.2180	.....	
31,000	31,000	.2400	.....	
32,000	32,000	.2620	.....	
33,000	33,000	.2850	.....	
34,000	34,000	.3140	.....	
35,000	35,000	.37	.....	
36,000	36,000	.40	.....	
37,000	37,000	.44	.....	
38,000	38,000	.47	.....	
39,000	39,000	.52	.....	
40,000	40,000	.57	.....	
41,000	41,000	.62	.....	
42,000	42,000	.69	.....	
43,000	43,000	.76	.....	
44,000	44,000	.85	.....	
45,000	45,000	.95	.....	
46,000	46,000	1.10	.....	
47,000	47,000	1.31	.....	
47,900	47,900	1.83	.....	Tensile strength.
0	0	2.17	.....	=21.7 per cent.

Fractured 8″.5 from the end of the axle. Appearance, fibrous.

Diameter at fracture, ″.77. Area, .466 square inch. Contraction, 53.4 per cent.

Elongation of inch sections, ″.14, ″.15, ″.15, ″.21, ″.69*, ″.25, ″.17, ″.14, ″.14, ″.13.

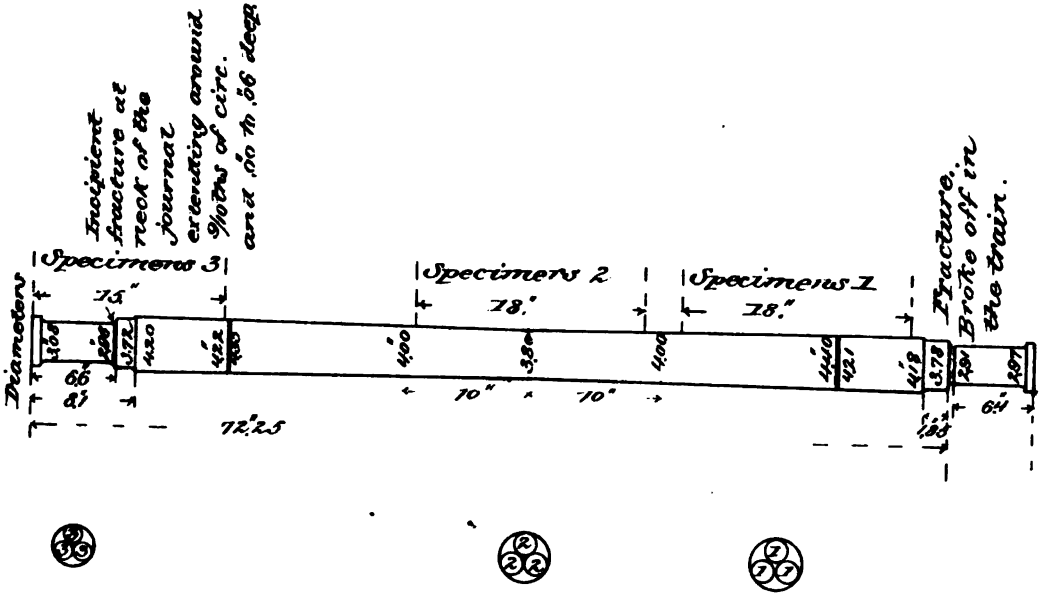
No. 1630.

Marks, 3.
Diameter, 1″.129.
Sectional, area, 1 square inch.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	1,000	0.	0.	Initial load.
5,000	5,000	.0014	0.	
10,000	10,000	.0031	0.	
15,000	15,000	.0048	0.	
17,000	17,000	.0060	.....	
17,300	17,300	.0062	.....	Elastic limit.
17,500	17,500	.0238	.....	
18,000	18,000	.0340	.....	
18,500	18,500	.0382	.....	
19,000	19,000	.0417	.....	
20,000	20,000	.0510	.....	
21,000	21,000	.0625	.....	
22,000	22,000	.0751	.....	
23,000	23,000	.0900	.....	
24,000	24,000	.1295	.....	
25,000	25,000	.1460	.....	
26,000	26,000	.1650	.....	
27,000	27,000	.1845	.....	
28,000	28,000	.2050	.....	
29,000	29,000	.2260	.....	
30,000	30,000	.2520	.....	
31,000	31,000	.2790	.....	
32,000	32,000	.3060	.....	
33,000	33,000	.3380	.....	
34,000	34,000	.3740	.....	
35,000	35,000	.43	.....	
36,000	36,000	.47	.....	
37,000	37,000	.52	.....	
38,000	38,000	.57	.....	
39,000	39,000	.63	.....	
40,000	40,000	.71	.....	
41,000	41,000	.78	.....	
42,000	42,000	.87	.....	
43,000	43,000	.98	.....	
44,000	44,000	1.13	.....	
45,000	45,000	1.38	.....	
46,000	46,000	1.84	.....	
46,090	46,090	2.07	.....	Tensile strength.
0	0	2.70	.....	= 27.0 per cent.

Fractured 13″ from the end of the axle. Appearance, fibrous.
Diameter at fracture, ″.77. Area, .466 square inch. Contraction, 53.4 per cent.
Elongation of inch sections, ″.15, ″.15, ″.15, ″.23, ″.25, ″.20, ″.24, ″.25, ″.58*, ″.50*.

Wrought iron, R.R. passenger axle.



End view of the fracture which occurred in the train. Section a a was an old fracture, it had a smooth surface. Section b was the new fracture, 1 3/8' diameter, appearance fibrous, slightly granular.

H Ex 45 50 2

WROUGHT-IRON PASSENGER-CAR AXLE, BRANDED 1871.

One journal of this axle fractured in service, showing a smooth surface of the metal, except at the center, where a section $1\frac{3}{8}$ inches in diameter was fibrous, slightly granular.

An inspection of the opposite journal revealed the presence of a crack at the fillet in the neck of the journal, which was visible around nine-tenths of the circumference, and reaching a maximum depth of ″.06.

Three specimens were taken from the middle, and three from the end, marked 1 in the accompanying sketch.

The journal containing the incipient crack was also cut into three pieces by longitudinal cuts; from one piece tensile specimen marked 3 was taken.

The test of this specimen is remarkable from the fact that the stem contained a part of the incipient crack which had developed while the axle was in service, and rupture occurred at a distance of $1\frac{1}{4}$ inches from this crack.

A bending test was made with the second piece from this journal, with the crack on the tension side of the bend. The metal was tough and fibrous below the crack, which had penetrated the metal from 0 to ″.05.

The surface of the metal at the crack was smooth, and resembled that part of the opposite journal which had fractured in the train.

The third piece is reserved to illustrate how minute incipient cracks of this kind appear in their early stages of development.

No. 1631.

Mark, 1.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	1,000	0.	0.	Initial load.
5,000	5,000	.0015	0.	
10,000	10,000	.0032	0.	
15,000	15,000	.0049	0.	
20,000	20,000	.0067	.0001	
20,500	20,500	.0069	.....	
21,000	21,000	.0071	.....	
21,500	21,500	.0073	.....	
22,000	22,000	.0075	.....	
22,500	22,500	.0077	.....	
23,000	23,000	.0080	.....	
23,500	23,500	.0084	.....	
24,000	24,000	.0087	.....	Elastic limit.
24,500	24,500	.0097	.....	
		.0118	.....	
25,000	25,000	.0207	.....	
26,000	26,000	.0370	.....	
27,000	27,000	.0550	.....	
28,000	28,000	.0780	.....	
29,000	29,000	.1030	.....	
30,000	30,000	.1290	.....	
31,000	31,000	.1560	.....	
32,000	32,000	.1850	.....	
33,000	33,000	.2080	.....	
34,000	34,000	.2320	.....	
35,000	35,000	.2900	.....	
36,000	36,000	.33	.....	
37,000	37,000	.39	.....	
38,000	38,000	.43	.....	
39,000	39,000	.50	.....	
40,000	40,000	.55	.....	
41,000	41,000	.62	.....	
42,000	42,000	.71	.....	
43,000	43,000	.80	.....	
44,000	44,000	.92	.....	
45,000	45,000	1.02	.....	
46,000	46,000	1.24	.....	
46,980	46,980	1.77	.....	Tensile strength.
0	0	1.96	.....	=19.6 per cent.

Fractured ″.75 from end of specimen. Appearance, fibrous.
Diameter at fracture, ″.92. Area, .665 square inch. Contraction, 33.5 per cent.

No. 1632.

Mark, 1.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	1,000	0.	0.	Initial load.
5,000	5,000	.0014	0.	
10,000	10,000	.0032	0.	
15,000	15,000	.0048	0.	
20,000	20,000	.0067	0.	
21,000	21,000	.0071	.....	
21,500	21,500	.0074	.....	Elastic limit.
22,000	22,000	.0080	.....	
22,500	22,500	.0098	.....	
23,000	23,000	.0123	.....	
24,000	24,000	.0165	.....	
25,000	25,000	.0324	.....	
26,000	26,000	.0453	.....	
27,000	27,000	.0675	.....	
28,000	28,000	.0905	.....	
29,000	29,000	.1141	.....	
30,000	30,000	.1430	.....	
31,000	31,000	.1710	.....	
32,000	32,000	.2035	.....	
33,000	33,000	.2350	.....	
34,000	34,000	.2730	.....	
35,000	35,000	.3150	.....	
36,000	36,000	.3500	.....	
37,000	37,000	.42	.....	
38,000	38,000	.47	.....	
39,000	39,000	.52	.....	
40,000	40,000	.59	.....	
41,000	41,000	.68	.....	
42,000	42,000	.77	.....	
43,000	43,000	.87	.....	
44,000	44,000	1.01	.....	
45,000	45,000	1.21	.....	
45,690	45,690	1.60	.....	Tensile strength.
0	0	1.87	.....	= 18.7 per cent.

Fractured 5½″ and 8″ from outside end of the axle. Appearance, fibrous.

Opened a seam not welded 6″ long, beginning at the neck of the specimen and extending along the stem. One-half the fracture occurred one side of this seam 5½″ from the end of the specimen; the other half fractured 2½″ further down the stem. The sides of the seam were ″.10 apart after fracture of the bar. It contained considerable cinder.

Diameter at fracture, ″.98. Area, .754 square inch. Contraction, 24.6 per cent.

Elongation of inch sections, ″.23, ″.23, ″.52*, ″.17, ″.14, ″.14, ″.12, ″.11, ″.11, ″.10.

No. 1633.

Mark, 1.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	1,000	0.	0.	Initial load.
5,000	5,000	.0015	0.	
10,000	10,000	.0031	0.	
15,000	15,000	.0048	0.	
20,000	20,000	.0065	0.	
21,000	21,000	.0071	.....	
21,500	21,500	.0073	.....	
22,000	22,000	.0075	.....	
22,500	22,500	.0077	.....	
23,000	23,000	.0080	.....	
23,500	23,500	.0083	.....	Elastic limit.
24,000	24,000	.0087	.....	
		.0095	.....	
24,500	24,500	.0150	.....	
25,000	25,000	.0211	.....	
26,000	26,000	.0290	.....	
27,000	27,000	.0447	.....	
28,000	28,000	.0640	.....	
29,000	29,000	.0847	.....	
30,000	30,000	.1100	.....	
31,000	31,000	.1350	.....	
32,000	32,000	.1650	.....	
33,000	33,000	.1950	.....	
34,000	34,000	.2230	.....	
35,000	35,000	.2600	.....	
36,000	36,000	.3000	.....	
37,000	37,000	.3390	.....	
38,000	38,000	.38	.....	
39,000	39,000	.44	.....	
40,000	40,000	.50	.....	
41,000	41,000	.56	.....	
42,000	42,000	.62	.....	
43,000	43,000	.72	.....	
44,000	44,000	.81	.....	
45,000	45,000	.92	.....	
46,000	46,000	1.07	.....	
46,800	46,800	1.32	.....	Tensile strength.
0	0	1.41	.....	=14.1 per cent.

Fractured 2″ from neck; inside end of specimen. Appearance, fibrous. Opened cracks in surface in vicinity of place of rupture.

Diameter at fracture, ″.98. Area, .754 square inch. Contraction, 24.6 per cent.

Elongation of inch sections, ″.10, ″.09, ″.13, ″.12, ″.14, ″.14, ″.14, ″.13, ″.17, ″.25*.

No. 1634.

Marks, 2.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	1,000	0.	0.	Initial load.
5,000	5,000	.0015	0.	
10,000	10,000	.0033	0.	
15,000	15,000	.0050	0.	
20,000	20,000	.0069	.0001	
21,000	21,000	.0072	.....	
22,000	22,000	.0077	.....	
22,500	22,500	.0080	.....	
23,000	23,000	.0082	.....	
23,500	23,500	.0087	.....	Elastic limit.
24,000	24,000	.0095	.....	
24,500	24,500	.0101	.....	
25,000	25,000	.0115	.....	
25,500	25,500	.0161	.....	
26,000	26,000	.0200	.....	
27,000	27,000	.0297	.....	
28,000	28,000	.0465	.....	
29,000	29,000	.0711	.....	
30,000	30,000	.0960	.....	
31,000	31,000	.1215	.....	
32,000	32,000	.1500	.....	
33,000	33,000	.1800	.....	
34,000	34,000	.2160	.....	
35,000	35,000	.2585	.....	
36,000	36,000	.2970	.....	
37,000	37,000	.3390	.....	
38,000	38,000	.41	.....	
39,000	39,000	.46	.....	
40,000	40,000	.53	.....	
41,000	41,000	.59	.....	
42,000	42,000	.68	.....	
43,000	43,000	.78	.....	
44,000	44,000	.90	.....	
45,000	45,000	1.07	.....	
46,000	46,000	1.34	.....	
46,920	46,920	1.96	.....	Tensile strength.
0	0	2.32	.....	=23.2 per cent.

Fractured 7″ from the neck. Appearance, fibrous.
Diameter at fracture, ″.91. Area, .650 square inch. Contraction, 35.0 per cent.
Elongation of inch sections, ″.17, ″.22, ″.22, ″.25, ″.35, ″.44*, ″.22, ″.17, ″.15, ″.13.

No. 1635.

Marks, 2.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	1,000	0.	0.	Initial load.
5,000	5,000	.0015	.0001	
10,000	10,000	.0038	.0001	
15,000	15,000	.0051	.0002	
20,000	20,000	.0069	.0002	
21,000	21,000	.0073	.....	
22,000	22,000	.0079	.....	
22,500	22,500	.0082	.....	
23,000	23,000	.0085	.....	Elastic limit.
23,500	23,500	.0096	.....	
24,000	24,000	.0101	.....	
24,500	24,500	.0108	.....	
25,000	25,000	.0117	.....	
25,500	25,500	.0130	.....	
26,000	26,000	.0158	.....	
27,000	27,000	.0211	.....	
28,000	28,000	.0350	.....	
29,000	29,000	.0507	.....	
30,000	30,000	.0730	.....	
31,000	31,000	.0980	.....	
32,000	32,000	.1235	.....	
33,000	33,000	.1512	.....	
34,000	34,000	.1830	.....	
35,000	35,000	.2130	.....	
36,000	36,000	.2475	.....	
37,000	37,000	.2900	.....	
38,000	38,000	.3300	.....	
39,000	39,000	.38	.....	
40,000	40,000	.43	.....	
41,000	41,000	.50	.....	
42,000	42,000	.56	.....	
43,000	43,000	.64	.....	
44,000	44,000	.73	.....	
45,000	45,000	.83	.....	
46,000	46,000	.98	.....	
47,000	47,000	1.20	.....	
48,000	48,000	1.58	.....	
48,200	48,200	1.84	.....	Tensile strength.
0	0	2.04	.....	=20.4 per cent.

Fractured 4″.8 from neck. Appearance, fibrous, 85 per cent.; granular, 15 per cent.

Diameter at fracture, ″.95. Area, .709 square inch. Contraction, 29.1 per cent.

Elongation of inch sections, ″.14, ″.19, ″.16, ″.16, ″.18, ″.23, ″.36*, ″.28, ″.17, ″.17.

No. 1636.

Marks, 2.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	Initial load.
5,000	5,000	.0015	0.	
10,000	10,000	.0032	0.	
15,000	15,000	.0049	0.	
20,000	20,000	.0069	0.	
21,000	21,000	.0072	.....	
22,000	22,000	.0077	.....	
22,500	22,500	.0081	.....	
23,000	23,000	.0085	.....	
23,500	23,500	.0088	.....	Elastic limit.
24,000	24,000	.0094	.....	
24,500	24,500	.0101	.....	
25,000	25,000	.0150	.....	
		.0194	.....	
26,000	26,000	.0280	.....	
27,000	27,000	.0407	.....	
28,000	28,000	.0570	.....	
29,000	29,000	.0738	.....	
30,000	30,000	.0945	.....	
31,000	31,000	.1168	.....	
32,000	32,000	.1405	.....	
33,000	33,000	.1658	.....	
34,000	34,000	.1940	.....	
35,000	35,000	.2250	.....	
36,000	36,000	.2600	.....	
37,000	37,000	.2985	.....	
38,000	38,000	.3425	.....	
39,000	39,000	.3880	.....	Surface cracks opened.
40,000	40,000	.4450	.....	
41,000	41,000	.52	.....	
42,000	42,000	.....	.....	Tensile strength.
0	0	.63	.....	= 6.3 per cent.

Fractured 5″.5 from neck. Appearance, granular with fibrous, spongy spot at the circumference.

Diameter at fracture, 1″.08. Area, .916 square inch. Contraction, 8.4 per cent.

Elongation of inch sections, ″.05, ″.05, ″.05, ″.05, ″.04, ″.13*, ″.06, ″.05, ″.04, ″.11.

No. 1637.

Marks, 3.
Total length of specimen, 18″.
Length of stem, 9″.
Diameter of heads, 1¼″.
Diameter, 1″.0092.
Sectional area, .80 square inch.
Gauged length, 6″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
800	1,000	0.	0.	Initial load.
4,000	5,000	.0009	.....	
8,000	10,000	.0019	.....	
12,000	15,000	.0029	.....	
14,400	18,000	.0035	.....	
15,200	19,000	.0037	.....	
16,000	20,000	.0039	.....	
16,800	21,000	.0042 / .0070	.....	Elastic limit.
17,200	21,500	.0094	.....	
17,600	22,000	.0117	.....	
18,400	23,000	.0157	.....	
19,200	24,000	.0247	.....	
20,000	25,000	.0428	.....	
20,800	26,000	.0545	.....	
21,600	27,000	.0658	.....	
22,400	28,000	.0795	.....	
23,200	29,000	.0930	.....	
24,000	30,000	.1086	.....	
24,800	31,000	.1265	.....	
25,600	32,000	.1468	.....	
26,400	33,000	.1680	.....	
27,200	34,000	.1895	.....	
28,000	35,000	.2150	.....	
28,800	36,000	.2417	.....	
29,600	37,000	.28	.....	
30,400	38,000	.31	.....	
31,200	39,000	.36	.....	
32,000	40,000	.40	.....	
32,800	41,000	.46	.....	
33,600	42,000	.53	.....	
34,400	43,000	.63	.....	
35,200	44,000	.77	.....	
35,880	44,860	1.10	.....	Tensile strength.
0	0	1.35	.....	= 22.5 per cent.

Fractured 3½″ from neck of specimen and 1¼″ from the crack in the journal at the base of the fillet, fracturing on the side of the crack towards the outer end of the journal.

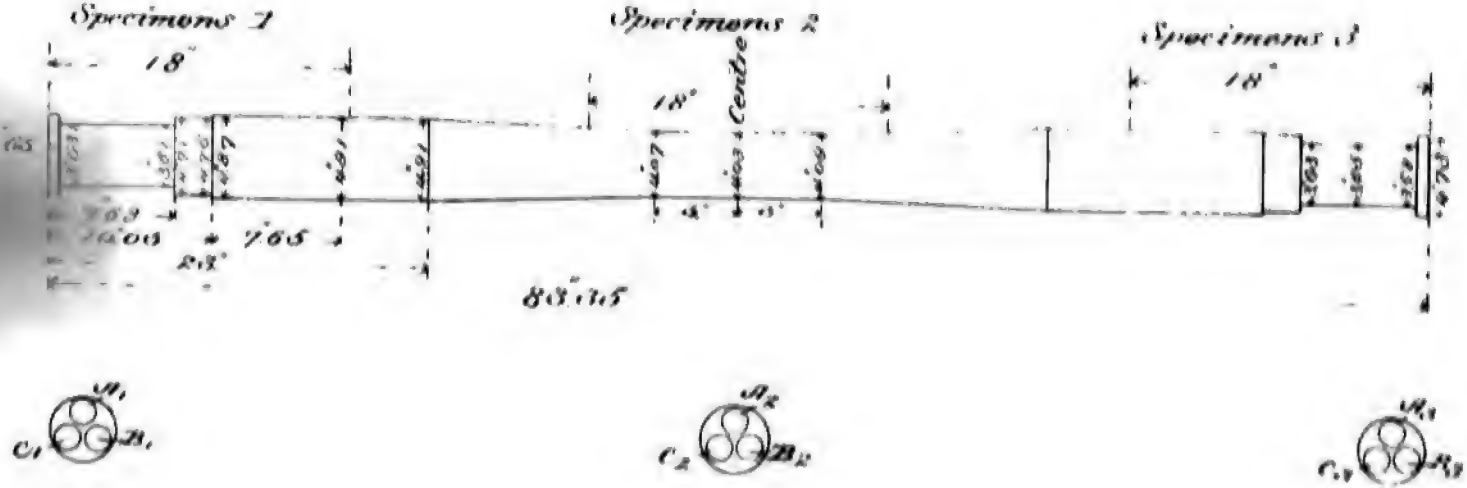
Previous to the test none of the crack which was in the journal showed on the surface of the specimen, so fine was the crack; during the test, however, the metal opened at the crack and showed its extent to be ″.30 long and ″.04 deep. The metal below this crack a distance of about ″.05 separated during the test with a fibrous appearance.

It is significant that notwithstanding the presence of the rupture of the metal at the crack, that the specimen broke at another place away from this plane, with a fair tensile strength, thus showing that the metal of the axle beyond or below the crack in the journal was not materially affected by the crack, nor by the causes which produced the crack.

Diameter at fracture, ″.78. Area, .478 square inch. Contraction, 40.2 per cent.

Elongation of inch sections, ″.10, ″.12, ″.12, ″.15, ″.19, ″.41*, ″.36, ″.22.

Muck bar tender axle. *No. 5.*



H Ex 45 50 2

MUCK-BAR TENDER AXLE NO. 5.

Axle taken out of service after having run 197,290 miles.

Continuation of tests of muck-bar tender axles from Report of 1885, page 1007, and subsequent reports.

No. 1604.

Marks, $\frac{M\ B_5}{A_1}$

Diameter, 1″.129.

Sectional area, 1 square inch.

Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	1,000	0.	0.	Initial load.
5,000	5,000	.0015	0.	
10,000	10,000	.0035	0.	
15,000	15,000	.0051	0.	
18,000	18,000	.0061	.....	
20,000	20,000	.0068	.0001	
21,000	21,000	.0073	.....	Elastic limit
21,500	21,500	.0078	.....	
22,000	22,000	.0086	.....	
22,500	22,500	.0103	.....	
23,000	23,000	.0128	.....	
23,500	23,500	.0148	.....	
24,000	24,000	.0195	.....	
25,000	25,000	.0355	.0268	
26,000	26,000	.0515	.....	
27,000	27,000	.0735	.....	
28,000	28,000	.1075	.....	
29,000	29,000	.1340	.....	
30,000	30,000	.1600	.....	
31,000	31,000	.1900	.....	
32,000	32,000	.2225	.....	
33,000	33,000	.2550	.....	
34,000	34,000	.2920	.....	
35,000	35,000	.33	.....	
36,000	36,000	.38	.....	
37,000	37,000	.42	.....	
38,000	38,000	.47	.....	
39,000	39,000	.52	.....	
40,000	40,000	.59	.....	
41,000	41,000	.66	.....	
42,000	42,000	.73	.....	
43,000	43,000	.83	.....	
44,000	44,000	.97	.....	
45,000	45,000	1.12	.....	
46,000	46,000	1.38	.....	
47,000	47,000	1.70	.....	
47,410	47,410	2.24	.....	Tensile strength.
41,200	.....	.....	.....	Load at time of rupture.
0	0	2.75	.....	= 27.5 per cent.

Fractured 4″.10 from neck, or 7″.4 from outside end of specimen. Appearance, fibrous.

Diameter at fracture, ″.81. Area, .515 square inch. Contraction, 48.5 per cent.

Elongation of inch sections, ″.18, ″.19, ″.21, ″.25, ″.21, ″.23, ″.26, ″.62*, ″.35, ″.25.

No. 1605.

Marks, $\frac{M B_3}{B_1}$
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	1,000	0.	0.	Initial load.
5,000	5,000	.0013	0.	
10,000	10,000	.0032	0.	
15,000	15,000	.0049	0.	
18,000	18,000	.0059	0.	
20,000	20,000	.0067	.0001	Elastic limit.
20,500	20,500	.0078	.....	
21,000	21,000	.0147	.....	
21,500	21,500	.0212	.....	
22,000	22,000	.0245	.....	
23,000	23,000	.0368	.....	
24,000	24,000	.0555	.....	
25,000	25,000	.0870	.0795	
26,000	26,000	.1150	.....	
27,000	27,000	.1380	.....	
28,000	28,000	.1600	.....	
29,000	29,000	.1900	.....	
30,000	30,000	.2200	.....	
31,000	31,000	.2520	.....	
32,000	32,000	.2880	.....	
33,000	33,000	.3265	.....	
34,000	34,000	.37	.....	
35,000	35,000	.42	.....	
36,000	36,000	.47	.....	
37,000	37,000	.52	.....	
38,000	38,000	.58	.....	
39,000	39,000	.64	.....	
40,000	40,000	.74	.....	
41,000	41,000	.84	.....	
42,000	42,000	.97	.....	
43,000	43,000	1.12	.....	
44,000	44,000	1.35	.....	
45,000	45,000	1.74	.....	
45,200	45,200	2.15	.....	Tensile strength.
0	0	2.55	.....	= 25.5 per cent.

Fractured 7″.50 from neck, or 10″.60 from outside end of specimen. Appearance, fibrous.

Diameter at fracture, ″.85. Area, .567 square inch. Contraction, 43.3 per cent.

Elongation of inch sections, ″.18, ″.19, ″.21, ″.26, ″.74*, ″.15, ″.24, ″.20, ″.21, ″.17,

No. 1606.

Marks, $\frac{M\ B_2}{C_1}$
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	1,000	0.	0.	Initial load.
5,000	5,000	.0015	0.	
10,000	10,000	.0033	0.	
15,000	15,000	.0051	0.	
18,000	18,000	.0061	.....	
20,000	20,000	.0068	.0001	
20,500	20,500	.0072	.....	
21,000	21,000	.0076	.....	
21,500	21,500	.0080	.....	Elastic limit.
22,000	22,000	.0089	.....	
22,500	22,500	.0120	.....	
23,000	23,000	.0193	.....	
23,500	23,500	.0240	.....	
24,000	24,000	.0284	.....	
25,000	25,000	.0460	.0373	
26,000	26,000	.0675	.....	
27,000	27,000	.0960	.....	
28,000	28,000	.1275	.....	
29,000	29,000	.1550	.....	
30,000	30,000	.1825	.....	
31,000	31,000	.2160	.....	
32,000	32,000	.2470	.....	
33,000	33,000	.2810	.....	
34,000	34,000	.33	.....	
35,000	35,000	.36	.....	
36,000	36,000	.41	.....	
37,000	37,000	.46	.....	
38,000	38,000	.51	.....	
39,000	39,000	.58	.....	
40,000	40,000	.67	.....	
41,000	41,000	.73	.....	
42,000	42,000	.82	.....	
43,000	43,000	.94	.....	
44,000	44,000	1.10	.....	
45,000	45,000	1.29	.....	
46,000	46,000	1.72	.....	
46,300	46,300	2.07	.....	Tensile strength.
0	0	2.41	.....	=24.1 per cent.

Fractured 6″.10 from neck, or 12″ from outside end of specimen. Appearance, fibrous.

Diameter at fracture, ″.90. Area, .636 square inch. Contraction, 36.4 per cent.

Elongation of inch sections, ″.19, ″.18, ″.16, ″.22, ″.23, ″.26, ″.49*, ″.27, ″.23, ″.18.

No. 1607.

Marks, $\frac{M\ B_5}{A_2}$
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	1,000	0.	0.	Initial load.
5,000	5,000	.0015	0.	
10,000	10,000	.0034	0.	
15,000	15,000	.0051	0.	
20,000	20,000	.0069	.0001	
21,000	21,000	.0071	.....	
21,500	21,500	.0074	.....	
22,000	22,000	.0076	.....	
22,500	22,500	.0079	.....	
23,000	23,000	.0081	.....	
23,500	23,500	.0084	.....	
24,000	24,000	.0088	.....	
24,500	24,500	.0092	.....	Elastic limit.
25,000	25,000	.0110	.0030	
25,500	25,500	.0154	.....	
26,000	26,000	.0220	.....	
27,000	27,000	.0430	.....	
28,000	28,000	.0824	.....	
29,000	29,000	.1067	.....	
30,000	30,000	.1290	.....	
31,000	31,000	.1615	.....	
32,000	32,000	.1900	.....	
33,000	33,000	.2250	.....	
34,000	34,000	.2640	.....	
35,000	35,000	.31	.....	
36,000	36,000	.36	.....	
37,000	37,000	.41	.....	
38,000	38,000	.47	.....	
39,000	39,000	.53	.....	
40,000	40,000	.59	.....	
41,000	41,000	.68	.....	
42,000	42,000	.78	.....	
43,000	43,000	.90	.....	
44,000	44,000	1.08	.....	
45,000	45,000	1.32	.....	
46,000	46,000	1.88	.....	
46,090	46,090	2.07	.....	Tensile strength.
39,200	.....	.....	.....	Load at time of rupture.
0	0	2.56	.....	=25.6 per cent.

Fractured 4″.70 from neck. Appearance, fibrous.

Diameter at fracture, ″.79. Area, .490 square inch. Contraction, 51.0 per cent.

Elongation of inch sections, ″.15, ″.20, ″.63*, ″.35, ″.24, ″.20, ″.19, ″.20, ″.22, ″.18.

No. 1608.

Marks, $\frac{M\ B.}{B.}$
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	1,000	0.	0.	Initial load.
5,000	5,000	.0014	0.	
10,000	10,000	.0033	0.	
15,000	15,000	.0050	0.	
20,000	20,000	.0069	.0001	
20,500	20,500	.0071	.....	
21,000	21,000	.0075	.....	
21,500	21,500	.0077	.....	
22,000	22,000	.0080	.....	
22,500	22,500	.0083	.....	
23,000	23,000	.0086	.....	
23,500	23,500	.0090	.....	Elastic limit.
24,000	24,000	.0100	.....	
24,500	24,500	.0295	.....	
25,000	25,000	.0372	.0287	
26,000	26,000	.0515	.....	
27,000	27,000	.0826	.....	
28,000	28,000	.1050	.....	
29,000	29,000	.1340	.....	
30,000	30,000	.1640	.....	
31,000	31,000	.1975	.....	
32,000	32,000	.2350	.....	
33,000	33,000	.2650	.....	
34,000	34,000	.3025	.....	
35,000	35,000	.36	.....	
36,000	36,000	.41	.....	
37,000	37,000	.46	.....	
38,000	38,000	.51	.....	
39,000	39,000	.59	.....	
40,000	40,000	.69	.....	
41,000	41,000	.78	.....	
42,000	42,000	.90	.....	
43,000	43,000	1.07	.....	
44,000	44,000	1.29	.....	
44,980	44,980	1.93	.....	Tensile strength.
0	0	2.30	.....	= 22.0 per cent.

Fractured 4″ from neck. Appearance, fibrous.
Diameter at fracture, ″.80. Area, .503 square inch. Contraction, 49.7 per cent.
Elongation of inch sections, ″.20, ″.35, ″.57*, ″.24, ″.20, ″.17, ″.16, ″.14, ″.14, ″.13.

No. 1609.

Marks, $\frac{M B_1}{C_1}$
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	1,000	0.	0.	Initial load.
5,000	5,000	.0015	0.	
10,000	10,000	.0034	0.	
15,000	15,000	.0050	0.	
20,000	20,000	.0069	.0001	
20,500	20,500	.0071	.....	
21,000	21,000	.0073	.....	
21,500	21,500	.0075	.....	
22,000	22,000	.0077	.....	
22,500	22,500	.0079	.....	
23,000	23,000	.0082	.....	
23,500	23,500	.0084	.....	
24,000	24,000	.0086	.....	
24,500	24,500	.0089	.....	
25,000	25,000	.0092	.0006	Elastic limit.
25,500	25,500	.0108	.....	
26,000	26,000	.0153	.....	
26,500	26,500	.0227	.....	
27,000	27,000	.0358	.....	
28,000	28,000	.0480	.....	
29,000	29,000	.0735	.....	
30,000	30,000	.1090	.....	
31,000	31,000	.1870	.....	
32,000	32,000	.1640	.....	
33,000	33,000	.1990	.....	
34,000	34,000	.2330	.....	
35,000	35,000	.2730	.....	
36,000	36,000	.33	.....	
37,000	37,000	.38	.....	
38,000	38,000	.42	.....	
39,000	39,000	.48	.....	
40,000	40,000	.53	.....	
41,000	41,000	.62	.....	
42,000	42,000	.71	.....	
43,000	43,000	.81	.....	
44,000	44,000	.96	.....	
45,000	45,000	1.17	.....	
46,000	46,000	1.47	.....	
46,280	46,280	1.78	.....	Tensile strength.
0	0	2.09	.....	=20.9 per cent.

Fractured 4″.5 from neck. Appearance, fibrous.

Diameter at fracture, ″.83. Area, .541 square inch. Contraction, 45.9 per cent.

Elongation of inch sections, ″.13, ″.12, ″.13, ″.14, ″.15, ″.17, ″.27, ″.57*, ″.23, ″.18.

No. 1610.

Marks, $\frac{M\ B_3}{A_3}$
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	1,000	0.	0.	Initial load.
5,000	5,000	.0015	0.	
10,000	10,000	.0034	0.	
15,000	15,000	.0050	0.	
18,000	18,000	.0061	.....	
20,000	20,000	.0069	.0002	
20,500	20,500	.0074	.....	
21,000	21,000	.0077	.....	Elastic limit.
21,500	21,500	.0087	.....	
22,000	22,000	.0110	.....	
22,500	22,500	.0142	.....	
23,000	23,000	.0193	.....	
24,000	24,000	.0275	.....	
25,000	25,000	.0510	.0425	
26,000	26,000	.0700	.....	
27,000	27,000	.0970	.....	
28,000	28,000	.1210	.....	
29,000	29,000	.1470	.....	
30,000	30,000	.1775	.....	
31,000	31,000	.2050	.....	
32,000	32,000	.2375	.....	
33,000	33,000	.2730	.....	
34,000	34,000	.3125	.....	
35,000	35,000	.36	.....	
36,000	36,000	.41	.....	
37,000	37,000	.46	.....	
38,000	38,000	.50	.....	
39,000	39,000	.55	.....	
40,000	40,000	.62	.....	
41,000	41,000	.70	.....	
42,000	42,000	.79	.....	
43,000	43,000	.90	.....	
44,000	44,000	1.02	.....	
45,000	45,000	1.19	.....	
46,000	46,000	1.41	.....	
47,000	47,000	1.91	.....	
47,090	47,090	2.15	.....	Tensile strength.
0	0	2.46	.....	=24.6 per cent.

Fractured 6″.60 from neck, or 11″.35 from outside end of specimen. Appearance, fibrous, seamy; trace of granulation.

Diameter at fracture, ″.88. Area, .608 square inch. Contraction, 39.2 per cent.

Elongation of inch sections, ″.19, ″.21, ″.22, ″.20, ″.25, ″.47*, ″.34, ″.20, ″.19, ″.19.

No. 1611.

Marks, $\frac{M\ B_3}{B_2}$
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	1,000	0.	0.	Initial load.
5,000	5,000	.0015	0.	
10,000	10,000	.0032	0.	
15,000	15,000	.0050	0.	
18,000	18,000	.0060	0.	
20,000	20,000	.0068	.0001	
20,500	20,500	.0071	.....	
21,000	21,000	.0076	.....	
21,500	21,500	.0080	.....	
22,000	22,000	.0085	.....	Elastic limit.
22,500	22,500	.0116	.....	
23,000	23,000	.0241	.....	
24,000	24,000	.0355	.....	
25,000	25,000	.0656	.0560	
26,000	26,000	.0925	.....	
27,000	27,000	.1142	.....	
28,000	28,000	.1410	.....	
29,000	29,000	.1680	.....	
30,000	30,000	.1975	.....	
31,000	31,000	.2300	.....	
32,000	32,000	.2640	.....	
33,000	33,000	.3000	.....	
34,000	34,000	.3412	.....	
35,000	35,000	.39	.....	
36,000	36,000	.44	.....	
37,000	37,000	.49	.....	
38,000	38,000	.54	.....	
39,000	39,000	.61	.....	
40,000	40,000	.69	.....	
41,000	41,000	.78	.....	
42,000	42,000	.88	.....	
43,000	43,000	1.02	.....	
44,000	44,000	1.18	.....	
45,000	45,000	1.42	.....	
45,220	45,220	2.11	.....	Tensile strength.
0	0	2.40	.....	= 24.0 per cent.

Fractured 2″ from neck, or 15″.75 from outside end of specimen. Appearance, fibrous.

Diameter at fracture, ″.89. Area, .622 square inch. Contraction, 37.8 per cent.

Elongation of inch sections, ″.15, ″.16, ″.16, ″.20, ″.21, ″.25, ″.24, ″.23, ″.26, ″.54*.

No. 1612.

Marks, $\frac{M\ B_2}{C_2}$
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	1,000	0.	0.	Initial load.
5,000	5,000	.0015	0.	
10,000	10,000	.0033	0.	
15,000	15,000	.0051	0.	
18,000	18,000	.0061	0.	
20,000	20,000	.0069	.0001	
20,500	20,500	.0072	.....	
21,000	21,000	.0076	.....	
21,500	21,500	.0080	.....	Elastic limit.
22,000	22,000	.0099	.....	
22,500	22,500	.0148	.....	
23,000	23,000	.0213	.....	
24,000	24,000	.0290	.....	
25,000	25,000	.0486	.0398	
26,000	26,000	.0687	.....	
27,000	27,000	.0905	.....	
28,000	28,000	.1205	.....	
29,000	29,000	.1448	.....	
30,000	30,000	.1717	.....	
31,000	31,000	.2040	.....	
32,000	32,000	.2340	.....	
33,000	33,000	.2680	.....	
34,000	34,000	.3090	.....	
35,000	35,000	.3480	.....	
36,000	36,000	.41	.....	
37,000	37,000	.46	.....	
38,000	38,000	.51	.....	
39,000	39,000	.58	.....	
40,000	40,000	.62	.....	
41,000	41,000	.71	.....	
42,000	42,000	.81	.....	
43,000	43,000	.91	.....	
44,000	44,000	1.04	.....	
45,000	45,000	1.26	.....	
46,000	46,000	1.65	.....	
46,290	46,290	1.90	.....	Tensile strength.
0	0	2.27	.....	=22.7 per cent.

Fractured 6″.6 from neck, or 9″.5 from outside end of specimen. Appearance, fibrous.

Diameter at fracture, ″.88. Area, .608 square inch. Contraction, 39.2 per cent.

Elongation of inch sections, ″.14, ″.14, ″.15, ″.22, ″.53*, ″.29, ″.21, ″.20, ″.19, ″.20.

MUCK-BAR TENDER AXLE NO. 6.

Taken from tender truck of engine No. 103, Boston and Albany Railroad, after having run 271,702 miles.

This axle was taken out of service on account of the journal, end B, having been overheated. The axle was found hot (said to show color) after a run of 20 miles on the day of overheating; it was then cooled with water and run an additional 20 miles, which caused further heating. After the second heating the axle cooled in place without water.

Before cutting into specimens the axle was mounted on bearings at the wheel seats, and revolved to ascertain the amount the journals were out of line.

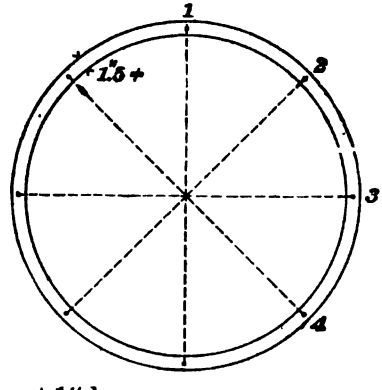
Journal B was found to run out of line ".10, measured at the outer end, and journal A about ".05. The bends were apparently at the inner ends of the journals.

In addition to the tensile specimens, disks A and B were examined for the presence of internal strains in the metal near the surface of the journals. When the rings were detached from the outside of these disks there were internal strains released, as shown by the ellipticity acquired.

In disk B the mean diameters show that a very slight compressive strain existed in the outside metal as a whole; the metal of disk A showed a condition of more intense strain.

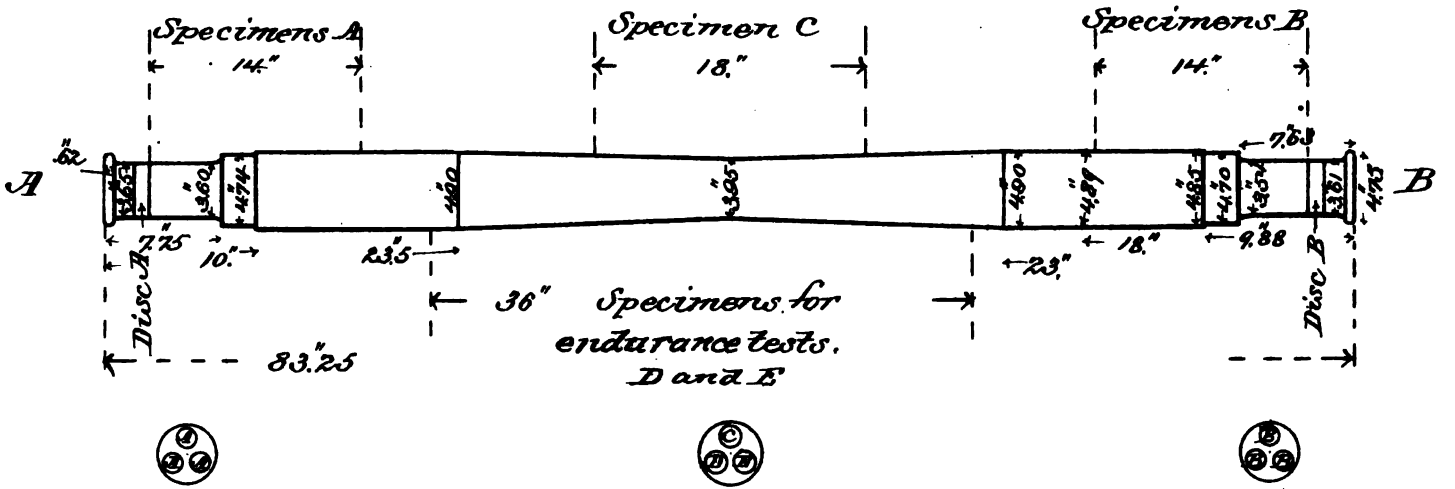
Two specimens for endurance tests were taken from the middle of the axle. The results of these tests appear under their appropriate heading.

Sketch of detached ring, diameters 1 *to* 4 *measured, to determine internal strains.*



Disks are each about 1" long.

Muck bar tender axle. No. 6.



H Ex 45 50 2

DISK A.

Exterior diameter, 3″.625.

	Surface diameters.				
	1	2	3	4	Mean.
	Inches.	*Inches.*	*Inches.*	*Inches.*	*Inches.*
Before ring was detached	3.4763	3.4729	3.4730	3.4742	3.4741
Ring detached.....	3.4766	3.4726	3.4738	3.4755	3.4746
	+.0003	−.0003	+.0008	+.0013	+.0005

DISK B.

Exterior diameter, 3″.585.

	Surface diameters.				
	1	2	3	4	Mean.
	Inches.	*Inches.*	*Inches.*	*Inches.*	*Inches.*
Before ring was detached	3.4242	3.4298	3.4277	3.4268	3.427125
Ring detached.....	3.4238	3.4304	3.4281	3.4263	3.427150
	−.0004	+.0006	+.0004	−.0005	+.000025

No. 2087.

Mark, A.
Diameter, ″.798.
Sectional area, .50 square inch.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
500	1,000	0.	0.	Initial load.
2,500	5,000	.0012	.....	
5,000	10,000	.0029	.....	
7,500	15,000	.0047	0.	
10,000	20,000	.0065	.0001	
10,500	21,000	.0075 / .0096	.....	Elastic limit.
11,000	22,000	.0120	.....	
11,500	23,000	.0230	.....	
12,000	24,000	.0380	.....	
12,500	25,000	.0600	.....	
13,000	26,000	.0800	.....	
13,500	27,000	.1140	.....	
14,000	28,000	.1405	.....	
14,500	29,000	.17	.....	
15,000	30,000	.21	.....	
15,500	31,000	.23	.....	
16,000	32,000	.27	.....	
16,500	33,000	.30	.....	
17,000	34,000	.34	.....	
17,500	35,000	.38	.....	
18,000	36,000	.43	.....	
18,500	37,000	.48	.....	
19,000	38,000	.54	.....	
19,500	39,000	.61	.....	
20,000	40,000	.68	.....	
20,500	41,000	.76	.....	
21,000	42,000	.88	.....	
21,500	43,000	1.00	.....	
22,000	44,000	1.22	.....	
22,500	45,000	1.54	.....	
22,620	45,240	1.90	.....	Tensile strength.
0	0	2.03	.....	= 20.3 per cent.

Fractured 5¼″ from neck. Appearance, fibrous.

Diameter at fracture, ″.66. Area, .342 square inch. Contraction, 31.6 per cent.

Elongation of inch sections, ″.13, ″.15, ″.17, ″.19, ″.20, ″.42*, ″.23, ″.22, ″.18, ″.14.

No. 2088.

Mark, A.
Diameter, ″.798.
Sectional area, .50 square inch.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
500	1,000	0.	0.	Initial load.
2,500	5,000	.0009	.....	
5,000	10,000	.0024	.....	
7,500	15,000	.0037	.....	
10,000	20,000	.0055	.....	
10,500	21,000	.0068	.....	Elastic limit.
11,000	22,000	.0084	.....	
11,500	23,000	.0125	.....	
12,000	24,000	.0217	.....	
12,500	25,000	.0338	.....	
13,000	26,000	.0520	.....	
13,500	27,000	.0935	.....	
14,000	28,000	.1150	.....	
14,500	29,000	.1420	.....	
15,000	30,000	.17	.....	
15,500	31,000	.20	.....	
16,000	32,000	.23	.....	
16,500	33,000	.27	.....	
17,000	34,000	.31	.....	
17,500	35,000	.35	.....	
18,000	36,000	.39	.....	
18,500	37,000	.43	.....	
19,000	38,000	.49	.....	
19,500	39,000	.54	.....	
20,000	40,000	.60	.....	
20,500	41,000	.70	.....	Rested 3 minutes.
21,000	42,000	.78	.....	
21,500	43,000	.87	.....	
22,000	44,000	.97	.....	
22,500	45,000	1.13	.....	
23,000	46,000	1.40	.....	
23,290	46,580	1.82	.....	Tensile strength.
0	0	2.19	.....	= 21.9 per cent.

Fractured 3″ from neck. Appearance, fibrous.

Diameter at fracture, ″.58. Area, .264 square inch. Contraction, 47.2 per cent.

Elongation of inch sections, ″.13, ″.14, ″.15, ″.17, ″.18, ″.18, ″.22, ″.54*, ″.29, ″.19.

No. 2089.

Mark, A.
Diameter, ″.798.
Sectional area, .50 square inch.
Rapid test.
Tensile strength, 23,600 pounds=47,200 pounds per square inch.
Fractured 3″.75 from neck. Appearance, fibrous.
Diameter at fracture, ″.59. Area, .273 square inch. Contraction, 45.4 per cent.
Elongation in 10 inches, 2″.42=24.2 per cent.
Elongation of inch sections, ″.15, ″.16, ″.18, ″.19, ″.21, ″.26, ″.26, ″.52*, ″.27, ″.22.
The time of making this test was 15 seconds in reaching the maximum stress; 10 seconds later, 25 seconds in all, the bar fractured.

No. 2093.

Mark, C.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	1,000	0.	0.	Initial load.
5,000	5,000	.0012	.....	
10,000	10,000	.0031	.....	
15,000	15,000	.0049	.....	
20,000	20,000	.0065	0.	
21,000	21,000	.0069	.....	
22,000	22,000	.0074	.....	
23,000	23,000	.0078	.....	
24,000	24,000	.0082	.....	
25,000	25,000	.0089	.....	
26,000	26,000	.0095	.0010	Elastic limit.
27,000	27,000	.0115	.....	
28,000	28,000	.0280	.....	
29,000	29,000	.0580	.....	
30,000	30,000	.0835	.....	
31,000	31,000	.1090	.....	
32,000	32,000	.1400	.....	
33,000	33,000	.18	.....	
34,000	34,000	.21	.....	
35,000	35,000	.25	.....	
36,000	36,000	.29	.....	
37,000	37,000	.33	.....	
38,000	38,000	.38	.....	
39,000	39,000	.43	.....	
40,000	40,000	.49	.....	
41,000	41,000	.58	.....	
42,000	42,000	.66	.....	
43,000	43,000	.74	.....	
44,000	44,000	.88	.....	
45,000	45,000	1.02	.....	
46,000	46,000	1.23	.....	
47,000	47,000	1.62	.....	
47,260	47,260	1.93	.....	Tensile strength.
0	0	2.47	.....	=24.7 per cent.

Fractured 5½″ from neck. Appearance, fibrous.
Diameter at fracture, ″.82. Area, .528 square inch. Contraction, 47.2 per cent.
Elongation of inch sections, ″.19, ″.19, ″.20, ″.20, ″.21, ″.25, ″.64*, ″.25, ″.18, ″.16.

No. 2090.

Mark, B.
Diameter, ".798.
Sectional area, .50 square inch.
Gauged length, 10".

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
500	1,000	0.	0.	Initial load
2,500	5,000	.0010	.....	
5,000	10,000	.0027	.....	
7,500	15,000	.0045	.....	
10,000	20,000	.0064	.0005	Elastic limit.
10,500	21,000	.0076	.....	
11,000	22,000	.0105	.....	
11,500	23,000	.0134	.....	
12,000	24,000	.0208	.....	
12,500	25,000	.0345	.....	
13,000	26,000	.0562	.....	
13,500	27,000	.0775	.....	
14,000	28,000	.0980	.....	
14,500	29,000	.1240	.....	
15,000	30,000	.1540	.....	
15,500	31,000	.19	.....	
16,000	32,000	.21	.....	
16,500	33,000	.25	.....	
17,000	34,000	.28	.....	
17,500	35,000	.31	.....	
18,000	36,000	.36	.....	
18,500	37,000	.41	.....	
19,000	38,000	.46	.....	
19,500	39,000	.52	.....	
20,000	40,000	.58	.....	
20,500	41,000	.68	.....	
21,000	42,000	.75	.....	
21,500	43,000	.85	.....	
22,000	44,000	.97	.....	
22,500	45,000	1.12	.....	
23,000	46,000	1.26	.....	
23,240	46,480	1.70	.....	Tensile strength.
0	0	1.95	.....	= 19.5 per cent.

Fractured 5" from neck. Appearance, fibrous.

Diameter at fracture, ".64. Area, .322 square inch. Contraction, 35.6 per cent.

Elongation of inch sections, ".14, ".15, ".17, ".19, ".20, ".45*, ".26, ".16, ".13, ".10.

No. 2091.

Mark, B.
Diameter, ″.798.
Sectional area, .50 square inch.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
500	1,000	0.	0.	Initial load.
2,500	5,000	.0013	.....	
5,000	10,000	.0031	.....	
7,500	15,000	.0048	0.	
9,000	18,000	.0060	.....	
9,500	19,000	.0064	.....	
10,000	20,000	.0071	.0010	Elastic limit.
10,500	21,000	.0118	.....	
11,000	22,000	.0160	.....	
11,500	23,000	.0255	.....	
12,000	24,000	.0386	.....	
12,500	25,000	.0560	.....	
13,000	26,000	.0860	.....	
13,500	27,000	.1100	.....	
14,000	28,000	.1380	.....	
14,500	29,000	.17	.....	
15,000	30,000	.19	.....	
15,500	31,000	.22	.....	
16,000	32,000	.26	.....	
16,500	33,000	.29	.....	
17,000	34,000	.33	.....	
17,500	35,000	.36	.....	
18,000	36,000	.40	.....	
18,500	37,000	.46	.....	
19,000	38,000	.50	.....	
19,500	39,000	.58	.....	
20,000	40,000	.65	.....	
20,500	41,000	.72	.....	
21,000	42,000	.82	.....	
21,500	43,000	.90	.....	
22,000	44,000	1.08	.....	
22,500	45,000	1.25	.....	
23,000	46,000	1.60 1.71	.....	Tensile strength.
0	0	2.00	.....	= 20.0 per cent.

Fractured ″.55 from neck. Appearance, fibrous.

Diameter at fracture, ″.62. Area, .302 square inch. Contraction, 39.6 per cent.

Elongation of inch sections, ″.12, ″.16, ″.17, ″.18, ″.48*, ″.24, ″.19, ″.17, ″.15, ″.14.

No. 2092.

Mark, B.
Diameter, ″.798.
Sectional area, .50 square inch.
Rapid test.
Tensile strength, 23,550 pounds = 47,100 pounds per square inch.
Fractured 5″.4 from neck. Appearance, fibrous, seamy.

Diameter at fracture, ″.63. Area, .312 square inch. Contraction, 37.6 per cent.

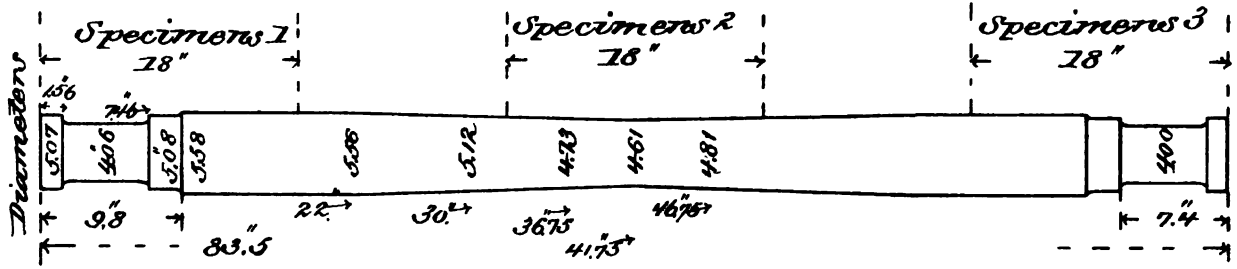
Elongation in 10 inches, 1″.92 = 19.2 per cent.

Elongation of inch sections, ″.13, ″.16, ″.16, ″.18, ″.23, ″.49*, ″.19, ″.16, ″.13, ″.09.

The time of making this test was about 15 seconds in reaching the maximum stress, rupture occurring about 6 seconds later.

Krupp Steel R.R. tender axle.

Branded, C 30031 and No. 73 F. Krupp 1887
I I Maerz



H Ex 45 50 2

Dimensions of forging.

No. 1647.

Mark, 1.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	1,000	0.	0.	Initial load.
5,000	5,000	.0013	0.	
10,000	10,000	.0029	0.	
15,000	15,000	.0047	0.	
20,000	20,000	.0063	0.	
25,000	25,000	.0079	0.	
30,000	30,000	.0096	0.	
35,000	35,000	.0113	0.	
40,000	40,000	.0129	0.	
40,500	40,500	.0130	.....	
41,000	41,000	.0132	.....	
41,500	41,500	.0133	.....	
42,000	42,000	.0135	.....	
42,500	42,500	.0137	.....	
43,000	43,000	.0139	.....	
43,500	43,500	.0141	.....	
44,000	44,000	.0142	.....	
44,500	44,500	.0145	.....	
45,000	45,000	.0147	.0001	
45,500	45,500	.0150	.....	
46,000	46,000	.0152	.....	Elastic limit.
43,000	43,000	.0240	.....	
		.0273	.....	
43,500	43,500	.0302	.....	
44,000	44,000	.0307	.....	
44,500	44,500	.0465	.....	
45,000	45,000	.0500	.....	
45,500	45,500	.0524	.....	
46,000	46,000	.0553	.....	
46,500	46,500	.0583	.....	
47,000	47,000	.0624	.....	
48,000	48,000	.0680	.....	
49,000	49,000	.0800	.....	
50,000	50,000	.0975	.....	
51,000	51,000	.1122	.....	
52,000	52,000	.1190	.....	
53,000	53,000	.1262	.....	
54,000	54,000	.14	.....	
55,000	55,000	.15	.....	
56,000	56,000	.16	.....	
58,000	58,000	.18	.....	
60,000	60,000	.195	.....	
62,000	62,000	.21	.....	
64,000	64,000	.225	.....	
66,000	66,000	.25	.....	
68,000	68,000	.28	.....	
70,000	70,000	.30	.....	
72,000	72,000	.32	.....	
74,000	74,000	.36	.....	
76,000	76,000	.39	.....	
78,000	78,000	.42	.....	
80,000	80,000	.47	.....	
82,000	82,000	.52	.....	
84,000	84,000	.58	.....	
86,000	86,000	.67	.....	
88,000	88,000	.78	.....	
89,000	89,000	.86	.....	
90,000	90,000	.95	.....	
91,000	91,000	1.09	.....	
91,100	91,100	1.16	.....	Tensile strength.
0	0	1.10	.....	=11.0 per cent.

Broke outside the gauged length at neck of specimen. Appearance, fine granular, radiating from a silky center.

Diameter at fracture, ″.91. Area, .650 square inch. Contraction, 35.0 per cent.

Elongation of inch sections, ″.08, ″.10, ″.10, ″.10, ″.11, ″.12, ″.12, ″.13, ″.11, ″.13.

No. 1648.

Mark, 1.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 10^{7}.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	1,000	0.	0.	Initial load.
5,000	5,000	.0013	0.	
10,000	10,000	.0030	0.	
15,000	15,000	.0046	0.	
20,000	20,000	.0064	0.	
25,000	25,000	.0081	0.	
30,000	30,000	.0097	0.	
35,000	35,000	.0114	0.	
38,500	38,500	.0125 .0132	.....	Elastic limit.
39,000	39,000	.0190	.....	
39,500	39,500	.0194	.....	
40,000	40,000	.0200	.....	
40,500	40,500	.0205	.....	
41,000	41,000	.0211	.....	
41,500	41,500	.0218	.....	
42,000	42,000	.0225	.....	
43,000	43,000	.0238	.....	
44,000	44,000	.0254	.....	
45,000	45,000	.0272	.....	
46,000	46,000	.0287	.....	
47,000	47,000	.0675	.....	
46,000	46,000	.0765	.....	
46,500	46,500	.0803	.....	
47,000	47,000	.0832	.....	
47,500	47,500	.0865	.....	
48,000	48,000	.0940	.....	
49,000	49,000	.1020	.....	
50,000	50,000	.1162	.....	
51,000	51,000	.1241	.....	
52,000	52,000	.1320	.....	
53,000	53,000	.1375	.....	
54,000	54,000	.145	.....	
55,000	55,000	.16	.....	
56,000	56,000	.17	.....	
58,000	58,000	.185	.....	
60,000	60,000	.205	.....	
62,000	62,000	.22	.....	
64,000	64,000	.24	.....	
66,000	66,000	.27	.....	
68,000	68,000	.30	.....	
70,000	70,000	.32	.....	
72,000	72,000	.36	.....	
74,000	74,000	.39	.....	
76,000	76,000	.42	.....	
78,000	78,000	.47	.....	
80,000	80,000	.52	.....	
82,000	82,000	.60	.....	
84,000	84,000	.68	.....	
86,000	86,000	.80	.....	
86,600	86,600	.92	.....	Tensile strength.
81,300	.....	.....	.....	Load at time of rupture.
0	0	1.01	.....	= 10.1 per cent.

Appearance of fracture, granular, radiating from dull eccentric spot
Diameter at fracture, ″.91. Area, .650 square inch. Contraction 35.0 per cent.

Elongation of inch sections, ″.27*, ″.19, ″.07, ″.08, ″.06, ″.08, ″.07, ″.06 ″.07, ″.06.

No. 1649.

Mark, 1.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	0	0.	0.	Initial load.
5,000	5,000	.0012	0.	
10,000	10,000	.0030	0.	
15,000	15,000	.0046	0.	
20,000	20,000	.0063	0.	
25,000	25,000	.0081	0.	
30,000	30,000	.0097	0.	
35,000	35,000	.0114	0.	
36,000	36,000	.0117	.....	
37,000	37,000	.0121	.....	
37,500	37,500	.0123	.....	Elastic limit.
38,000	38,000	.0157	.....	
		.0177	.....	
38,500	38,500	.0182	.....	
39,000	39,000	.0188	.....	
40,000	40,000	.0198	.....	
41,000	41,000	.0218	.....	
42,000	42,000	.0226	.....	
43,000	43,000	.0241	.....	
44,000	44,000	.0257	.....	
45,000	45,000	.0272	.....	
46,000	46,000	.0288	.....	
43,400	43,400	.0381	.....	
44,000	44,000	.0421	.....	
44,500	44,500	.0450	.....	
45,000	45,000	.0540	.....	
46,000	46,000	.0650	.....	
47,000	47,000	.0735	.....	
48,000	48,000	.0803	.....	
49,000	49,000	.0970	.....	
50,000	50,000	.1100	.....	
51,000	51,000	.1165	.....	
52,000	52,000	.1240	.....	
53,000	53,000	.1317	.....	
54,000	54,000	.15	.....	
56,000	56,000	.17	.....	
58,000	58,000	.185	.....	
60,000	60,000	.20	.....	
62,000	62,000	.22	.....	
64,000	64,000	.24	.....	
66,000	66,000	.27	.....	
68,000	68,000	.29	.....	
70,000	70,000	.31	.....	
72,000	72,000	.34	.....	
74,000	74,000	.37	.....	
76,000	76,000	.41	.....	
78,000	78,000	.45	.....	
80,000	80,000	.50	.....	
82,000	82,000	.56	.....	
84,000	84,000	.62	.....	
86,000	86,000	.73	.....	
87,000	87,000	.82	.....	
87,160	87,160	.88	.....	Tensile strength.
0	0	.98	.....	= 9.8 per cent.

Appearance of fracture, granular, radiating from a dull eccentric spot.
Diameter at fracture, ″.91. Area, .650 square inch. Contraction, 35.0 per cent.
Elongation of inch sections, ″.06, ″.06, ″.06, ″.06, ″.07, ″.07, ″.08, ″.07, ″.12, ″.33*.

No. 1650.

Marks, 2.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	Initial load.
5,000	5,000	.0014	0.	
10,000	10,000	.0031	0.	
15,000	15,000	.0048	0.	
20,000	20,000	.0067	0.	
25,000	25,000	.0083	0.	
30,000	30,000	.0100	0.	
35,000	35,000	.0115	.0001	
36,000	36,000	.0119	.....	
37,000	37,000	.0123	.....	
38,000	38,000	.0127	.....	Elastic limit.
38,500	38,500	.0148	.....	
38,000	38,000	.0168	.....	
38,500	38,500	.0168	.....	
39,000	39,000	.0171	.....	
39,500	39,500	.0174	.....	
40,000	40,000	.0180	.....	
41,000	41,000	.0188	.....	
42,000	42,000	.0200	.....	
43,000	43,000	.0211	.....	
44,000	44,000	.0224	.....	
44,500	44,500	.0252	.....	
45,000	45,000	.0360	.....	
46,000	46,000	.0462	.....	
47,000	47,000	.0668	.....	
48,000	48,000	.0722	.....	
49,000	49,000	.0780	.....	
50,000	50,000	.0845	.....	
51,000	51,000	.0900	.....	
52,000	52,000	.0975	.....	
53,000	53,000	.1035	.....	
54,000	54,000	.12	.....	
56,000	56,000	.13	.....	
58,000	58,000	.15	.....	
60,000	60,000	.17	.....	
62,000	62,000	.19	.....	
64,000	64,000	.205	.....	
66,000	66,000	.22	.....	
68,000	68,000	.24	.....	
70,000	70,000	.27	.....	
72,000	72,000	.29	.....	
74,000	74,000	.32	.....	
76,000	76,000	.34	.....	
78,000	78,000	.37	.....	
80,000	80,000	.41	.....	
82,000	82,000	.45	.....	
84,000	84,000	.50	.....	
86,000	86,000	.56	.....	
88,000	88,000	.65	.....	
89,960	89,960	.78	.....	Tensile strength.
0	0	.78	.....	=7.8 per cent.

Appearance of fracture, granular, radiating from a dull silky spc near the circumference.

Diameter at fracture, ″.99. Area, .770 square inch. Contractior 23.0 per cent.

Elongation of inch sections, ″.06, ″.06, ″.05, ″.06, ″.06, ″.06, ″.0 ″.05, ″.06, ″.21*.

No. 1651.

Marks, 2.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	Initial load.
5,000	5,000	.0018	0.	
10,000	10,000	.0039	0.	
15,000	15,000	.0046	0.	
20,000	20,000	.0065	0.	
25,000	25,000	.0083	0.	
30,000	30,000	.0100	0.	
35,000	35,000	.0116	.0001	
36,000	36,000	.0120	.....	
37,000	37,000	.0123	.....	Elastic limit.
37,500	37,500	.0126	.....	
		.0170	.....	
38,000	38,000	.0183	.....	
39,000	39,000	.0198	.....	
40,000	40,000	.0217	.....	
41,000	41,000	.0233	.....	
42,000	42,000	.0250	.....	
43,000	43,000	.0268	.....	
44,000	44,000	.0288	.....	
45,000	45,000	.0320	.....	
		.0560	.....	
46,000	46,000	.0650	.....	
47,000	47,000	.0718	.....	
48,000	48,000	.0775	.....	
49,000	49,000	.0835	.....	
50,000	50,000	.0902	.....	
51,000	51,000	.0968	.....	
52,000	52,000	.1040	.....	
53,000	53,000	.1107	.....	
54,000	54,000	.12	.....	
56,000	56,000	.13	.....	
58,000	58,000	.15	.....	
60,000	60,000	.18	.....	
62,000	62,000	.20	.....	
64,000	64,000	.21	.....	
66,000	66,000	.22	.....	
68,000	68,000	.25	.....	
70,000	70,000	.28	.....	
72,000	72,000	.30	.....	
74,000	74,000	.33	.....	
76,000	76,000	.37	.....	
78,000	78,000	.40	.....	
80,000	80,000	.43	.....	
82,000	82,000	.48	.....	
84,000	84,000	.54	.....	
86,000	86,000	.61	.....	
87,000	87,000	.68	.....	
88,000	88,000	.75	.....	
88,200	88,200	.82	.....	Tensile strength.
0	0	.87	.....	=8.7 per cent.

Appearance of fracture, granular, radiating from a dull silky spot at the circumference.

Diameter at fracture, ″.98. Area, .754 square inch. Contraction, 24.6 per cent.

Elongation of inch sections, ″.06, ″.06, ″.05, ″.06, ″.07, ″.07, ″.05, ″.05, ″.19*, ″.21*.

No. 1652.

Marks, 2.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	
5,000	5,000	.0013	0.	
10,000	10,000	.0030	0.	
15,000	15,000	.0047	0.	
20,000	20,000	.0064	0.	
25,000	25,000	.0081	0.	
30,000	30,000	.0097	0.	
35,000	35,000	.0115	0.	
36,000	36,000	.0119	.....	
36,800	36,800	.0121	.....	Elastic limit.
37,000	37,000	.0138	.....	
37,500	37,500	.0152	.....	
38,000	38,000	.0162	.....	
39,000	39,000	.0169	.....	
40,000	40,000	.0180	.....	
41,000	41,000	.0191	.....	
42,000	42,000	.0202	.....	
43,000	43,000	.0216	.....	
44,000	44,000	.0228	.....	
45,000	45,000	.0315	.....	
45,500	45,500	.0501	.....	
46,000	46,000	.0612	.....	
47,000	47,000	.0650	.....	
48,000	48,000	.0710	.....	
49,000	49,000	.0770	.....	
50,000	50,000	.0833	.....	
51,000	51,000	.0895	.....	
52,000	52,000	.0965	.....	
53,000	53,000	.1030	.....	
54,000	54,000	.115	.....	
56,000	56,000	.125	.....	
58,000	58,000	.14	.....	
60,000	60,000	.16	.....	
62,000	62,000	.18	.....	
64,000	64,000	.20	.....	
66,000	66,000	.22	.....	
68,000	68,000	.23	.....	
70,000	70,000	.26	.....	
72,000	72,000	.29	.....	
74,000	74,000	.31	.....	
76,000	76,000	.34	.....	
78,000	78,000	.38	.....	
80,000	80,000	.41	.....	
82,000	82,000	.45	.....	
84,000	84,000	.50	.....	
86,000	86,000	.56	.....	
88,000	88,000	.64	.....	
89,000	89,000	.71	.....	
89,120	89,120	.77	.....	Tensile strength.
0	0	.80	.....	=8.0 per cent.

Appearance of fracture, granular, radiating from a dull silky spot at the circumference.

Diameter at fracture, ″.99. Area, .770 square inch. Contraction 23.0 per cent.

Elongation of inch sections, ″.26*, ″.06, ″.05, ″.06, ″.06, ″.06, ″.0 ″.06, ″.06, ″.07.

No. 1653.

Marks, 3.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	Initial load.
5,000	5,000	.0013	0.	
10,000	10,000	.0031	0.	
15,000	15,000	.0047	0.	
20,000	20,000	.0063	0.	
25,000	25,000	.0081	0.	
30,000	30,000	.0098	0.	
35,000	35,000	.0114	0.	
36,000	36,000	.0119	.....	
37,000	37,000	.0122	.....	
38,000	38,000	.0125	.....	
39,000	39,000	.0129	.....	
40,000	40,000	.0132 .0148	.....	Elastic limit.
40,500	40,500	.0154	.....	
41,000	41,000	.0153	.....	
42,000	42,000	.0167	.....	
43,000	43,000	.0175	.....	
44,000	44,000	.0184	.....	
45,000	45,000	.0196	.....	
46,000	46,000	.0207	.....	
47,000	47,000	.0227	.....	
48,000	48,000	.0253	.....	
44,000	44,000	.0365	.....	Elongations under reduced loads.
44,500	44,500	.0417	.....	
45,000	45,000	.0475	.....	
46,000	46,000	.0538	.....	
47,000	47,000	.0748	.....	
48,000	48,000	.0820	.....	
49,000	49,000	.0960	.....	
50,000	50,000	.1085	.....	
51,000	51,000	.1160	.....	
52,000	52,000	.1230	.....	
53,000	53,000	.1295	.....	
54,000	54,000	.14	.....	
56,000	56,000	.16	.....	
58,000	58,000	.18	.....	
60,000	60,000	.20	.....	
62,000	62,000	.215	.....	
64,000	64,000	.23	.....	
66,000	66,000	.26	.....	
68,000	68,000	.28	.....	
70,000	70,000	.31	.....	
72,000	72,000	.33	.....	
74,000	74,000	.37	.....	
76,000	76,000	.40	.....	
78,000	78,000	.45	.....	
80,000	80,000	.50	.....	
82,000	82,000	.55	.....	
84,000	84,000	.62	.....	
85,000	85,000	.68	.....	
86,000	86,000	.73	.....	
86,200	86,200	.77	.....	Tensile strength.
0	0	.75	.....	= 7.5 per cent.

Appearance of fracture, granular, radiating from a dull, silky eccentric spot.

Diameter at fracture, ″.89. Area, .622 square inch. Contraction, 37.7 per cent.

Elongation of inch sections, ″.16*, ″.07, ″.07, ″.07, ″.06, ″.08, ″.07, ″.05, ″.06, ″.06.

No. 1654.

Marks, 3.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
1,000	1,000	0.	0.	Initial load.
5,000	5,000	.0015	0.	
10,000	10,000	.0031	0.	
15,000	15,000	.0047	0.	
20,000	20,000	.0065	0.	
25,000	25,000	.0081	0.	
30,000	30,000	.0099	0.	
35,000	35,000	.0115	0.	
36,000	36,000	.0120	.....	
37,000	37,000	.0124	.....	
38,000	38,000	.0126	.....	
39,000	39,000	.0130	.....	
40,000	40,000	.0133 .0212	.....	Elastic limit.
40,500	40,500	.0250	.....	
41,000	41,000	.0260	.....	
42,000	42,000	.0270	.....	
43,000	43,000	.0290	.....	
44,000	44,000	.0313	.....	
45,000	45,000	.0330	.....	
46,000	46,000	.0347	.....	
47,000	47,000	.0372	.....	
47,600	47,600	.0390	.....	
44,500	44,500	.0412 .0426	.....	
45,000	45,000	.0488	.....	
46,000	46,000	.0580	.....	
47,000	47,000	.0807	.....	
48,000	48,000	.0956	.....	
49,000	49,000	.1068	.....	
50,000	50,000	.1145	.....	
51,000	51,000	.1205	.....	
52,000	52,000	.1278	.....	
53,000	53,000	.1350	.....	
54,000	54,000	.145	.....	
56,000	56,000	.17	.....	
58,000	58,000	.185	.....	
60,000	60,000	.20	.....	
62,000	62,000	.22	.....	
64,000	64,000	.24	.....	
66,000	66,000	.27	.....	
68,000	68,000	.30	.....	
70,000	70,000	.32	.....	
72,000	72,000	.35	.....	
74,000	74,000	.39	.....	
76,000	76,000	.42	.....	
78,000	78,000	.48	.....	
80,000	80,000	.52	.....	
82,000	82,000	.60	.....	
84,000	84,000	.70	.....	
84,860	84,860	.82	.....	Tensile strength.
0	0	1.05	.....	= 10.5 per cent.

Appearance of fracture, fine granular, silky center.

Diameter at fracture, ″.87. Area, .594 square inch. Contraction, 40.6 per cent.

Elongation of inch sections, ″.17, ″.40*, ″.06, ″.07, ″.06, ″.06, ″.05, ″.06, ″.05, ″.07.

No. 1655.

Marks, 3.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	Initial load.
5,000	5,000	.0018	0.	
10,000	10,000	.0030	0.	
15,000	15,000	.0047	0.	
20,000	20,000	.0064	0.	
25,000	25,000	.0081	0.	
30,000	30,000	.0098	0.	
35,000	35,000	.0115	0.	
36,000	36,000	.0119	.....	
37,000	37,000	.0123	.....	
38,000	38,000	.0126	.....	
39,000	39,000	.0130	.....	Elastic limit.
39,500	39,500	.0155	.....	
38,000	38,000	.0180	.....	
38,500	38,500	.0190	.....	
39,000	39,000	.0201	.....	
39,500	39,500	.0208	.....	
40,000	40,000	.0217	.....	
41,000	41,000	.0227	.....	
42,000	42,000	.0243	.....	
43,000	43,000	.0257	.....	
44,000	44,000	.0272	.....	
45,000	45,000	.0288	.....	
46,000	46,000	.0301	.....	
47,000	47,000	.0320	.....	
48,000	48,000	.0330	.....	
44,000	44,000	.0455	.....	
		.0600	.....	
45,000	45,000	.0680	.....	
46,000	46,000	.0730	.....	
47,000	47,000	.0790	.....	
48,000	48,000	.0868	.....	
49,000	49,000	.0995	.....	
50,000	50,000	.1160	.....	
51,000	51,000	.1238	.....	
52,000	52,000	.1290	.....	
53,000	53,000	.1357	.....	
54,000	54,000	.15	.....	
56,000	56,000	.17	.....	
58,000	58,000	.19	.....	
60,000	60,000	.21	.....	
62,000	62,000	.23	.....	
64,000	64,000	.25	.....	
66,000	66,000	.27	.....	
68,000	68,000	.30	.....	
70,000	70,000	.32	.....	
72,000	72,000	.36	.....	
74,000	74,000	.40	.....	
76,000	76,000	.43	.....	
78,000	78,000	.48	.....	
80,000	80,000	.53	.....	
82,000	82,000	.60	.....	
84,000	84,000	.70	.....	
84,920	84,920	.80	.....	Tensile strength.
0	0	.97	.....	= 9.7 per cent.

Appearance of fracture, fine granular, radiating from a dull silky spot near the circumference.

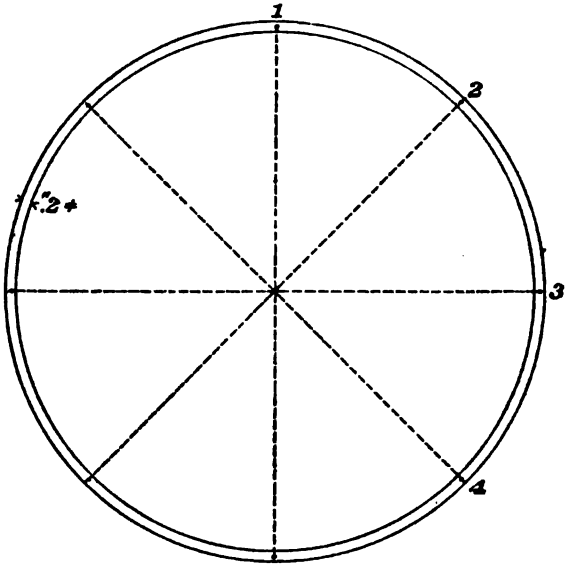
Diameter at fracture, ″.88. Area, .608 square inch. Contraction, 39.2 per cent.

Elongation of inch sections, ″.39*, ″.10, ″.05, ″.08, ″.05, ″.06, ″.06, ″.06, ″.06, ″.06.

DETERMINATION OF INTERNAL STRAINS IN WROUGHT IRON AND STEEL DISKS TAKEN FROM RAILWAY TENDER AXLES.

Disks E_1 and E_2 taken from English fagoted axle.
Disks S_1 and S_2 taken from Swedish axle.
Disks K_1 and K_2 taken from Krupp steel axle.

Sketch of detached ring, diameters 1 to 4 measured; afterward ring cut apart and chord 1–2 measured.



Disks are each about 1″.10 long.

DISK E_1.

Exterior diameter, 5″.64.

	Surface diameters.				
	1	2	3	4	Mean.
	Inches.	*Inches.*	*Inches.*	*Inches.*	*Inches.*
Before ring was detached	5.4286	5.4280	5.4250	5.4327	5.4286
Ring detached	5.4273	5.4310	5.4257	5.4389	5.4307
	−.0013	+.0030	+.0007	+.0062	+.0021

DISK E_2.

Exterior diameter, 5″.64.

	Surface diameters.				
	1	2	3	4	Mean.
	Inches.	*Inches.*	*Inches.*	*Inches.*	*Inches.*
Before ring was detached	5.4291	5.4229	5.4307	5.4284	5.4278
Ring detached	5.4339	5.4284	5.4297	5.4290	5.4303
	+.0048	+.0055	−.0010	+.0006	+.0025

DISK S_1.

Exterior diameter, 5″.54.

	Surface diameters.				
	1	2	3	4	Mean.
	Inches.	*Inches.*	*Inches.*	*Inches.*	*Inches.*
Before ring was detached	5.3257	5.3277	5.3291	5.3269	5.3273
Ring detached	5.3317	5.3270	5.3312	5.3282	5.3295
	+.0060	−.0007	+.0021	+.0013	+.0022

DISK S_2.

Exterior diameter, 5″.58.

	Surface diameters.				
	1	2	3	4	Mean.
	Inches.	*Inches.*	*Inches.*	*Inches.*	*Inches.*
Before ring was detached	5.3612	5.3618	5.3657	5.3621	5.3627
Ring detached	5.3611	5.3638	5.3642	5.3699	5.3647
	−.0001	+.0020	−.0015	+.0078	+.0020

DISK K_1.

Exterior diameter, 5″.55.

	Surface diameters.				
	1	2	3	4	Mean.
	Inches.	*Inches.*	*Inches.*	*Inches.*	*Inches.*
Before ring was detached	5.3452	5.3468	5.3442	5.3429	5.3448
Ring detached	5.3455	5.3495	5.3440	5.3429	5.3455
	+.0003	+.0027	−.0002	.0000	+.0007

DISK K_2.

Exterior diameter, 5″.56.

	Surface diameters.				
	1	2	3	4	Mean.
	Inches.	*Inches.*	*Inches.*	*Inches.*	*Inches.*
Before ring was detached	5.3515	5.3514	5.3515	5.3533	5.3519
Ring detached	5.3577	5.3509	5.3470	5.3564	5.3580
	+.0062	−.0005	−.0045	+.0031	+.0011

TABLE OF COMPUTED COMPRESSION STRESSES CORRESPONDING TO STRAINS FOUND IN DISKS.

Marks on disk.	Mean diameters.		Internal strain.	Internal compressive stress.	Assumed modulus of elasticity of metal.
	Before ring was detached.	Ring detached.			
	Inches.	*Inches.*	*Inch.*	*Pounds.*	*Pounds p. sq. in.*
E_1	5.4286	5.4307	+ .0021	10,830	28,000,000
E_2	5.4278	5.4303	+ .0025	12,900	28,000,000
S_1	5.3273	5.3295	+ .0022	11,560	28,000,000
S_2	5.3627	5.3647	+ .0020	10,440	28,000,000
K_1	5.3448	5.3455	+ .0007	3,890	29,700,000
K_2	5.3519	5.3530	+ .0011	6,100	29,700,000

After completing the measurements of the detached rings, the chords at extremities of diameters 1 and 2 were measured; then cutting the ring apart between these points the chord measurements were repeated, the difference showing the release of internal strains.

Disk.	Chord measurements.		
	Before cutting ring apart.	After ring was cut apart.	Difference.
	Inches.	*Inches.*	*Inch.*
E_1	2.0784	2.0900	.0116
E_2	2.0836	2.0887	.0051
S_1	2.0337	2.0392	.0055
S_2	2.0532	2.0690	.0158
K_1	2.0583	2.0667	.0084
K_2	2.0512	2.0900	.0388

When the rings were detached from the disks to which they belonged, the mean results were enlargement of diameters, thus showing the metal at the outside of the axles was left ready for service with compression strains representing stresses from 3,890 to 12,900 pounds per square inch. The irregular behavior of different diameters on the same ring indicates local strains of great magnitude.

Upon cutting the rings apart, the length of chord increased in each case, which indicates that the metal of each ring, after it was detached from the disk, assumed a state of equilibrium in which there were tensile strains at the outside and compression strains at the inside.

This explains the behavior of the rings after cutting apart, yet it may be that a more complex state of strains existed than here assumed to have been present.

TABULATION OF SPECIMENS FROM RAILROAD AXLES.

WROUGHT-IRON AXLE FROM PASSENGER TRUCK OF CAR WRECKED AT BUSSEY BRIDGE DISASTER.

No. of test.	Position in axle.	Diameter.	Sectional area.	Elastic limit.		Tensile strength.		Elongation in 10 inches.		Area at fracture.		Contraction of area.	Appearance of fracture.	Elongation of inch sections.									
				Total.	Per square inch.	Total.	Per square inch.	In.	Per cent.					"	"	"	"	"	"	"	"	"	"
		Inches.	*Sq. in.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*				*In. Sq. in.*	*Pr. ct.*											
1595	End	1.129	1.00	22,000	22,000	43,520	43,520	0.94	9.4	Diam.	1.00=.785	21.5	Fibrous, granular spot	.08,	.08,	.07,	.08′,	.08,	.07,	.09,	.13,	.17*,	.09
1596	...do	1.129	1.00	23,000	23,000	39,510	39,510	0.58	5.8	Diam.	1.05=.866	13.4	Fibrous, 65 per cent.; granular, 35 per cent.	.06,	.04,	.04,	.05,	.04,	.08,	.11*,	.07,	.04,	.05
1597	...do	1.129	1.00	22,500	22,500	42,800	42,800	0.88	8.8	Diam.	1.06=.882	11.8	Fibrous, contains cinder.	.06,	.08,	.09,	.07,	.07,	.08,	.09,	.17*,	.10,	.07
1598	Middle..	1.129	1.00	24,500	24,500	47,890	47,890	1.73	17.3	Diam.	.94=.694	30.6	Fibrous, trace of granulation.	.14,	.31*,	.16,	.14,	.15,	.18,	.20,	.17,	.14,	.14
1599	...do	1.129	1.00	23,000	23,000	47,440	47,440	1.79	17.9	Diam.	.95=.709	29.1	Fibrous, slightly granular.	.14,	.17,	.24,	.39*,	.19,	.15,	.14,	.14,	.11,	.12
1600	...do	1.129	1.00	23,000	23,000	46,510	46,510	1.66	16.6	Diam.	.99=.770	23.0	Fibrous, 65 per cent., granular, 35 per cent.	.13,	.14,	.16	.17,	.18,	.25*,	.22,	.15,	.13,	.13
1601	End	1.129	1.00	22,500	22,500	47,500	47,500	1.54	15.4	Diam	1.01=.801	19.9	Fibrous, trace of granulation.	.14,	.15,	.17,	.16,	.16,	.16,	.27*,	.13,	.10,	.10
1602	...do	1.129	1.00	21,000	21,000	47,710	47,710	1.98	19.8	Diam.	.97=.739	26.1	... do	.13,	.14,	.14,	.19,	.34*,	.25,	.20,	.19,	.20,	.20
1603	...do	1.129	1.00	20,000	20,000	46,620	46,620	1.97	19.7	Diam.	97=.739	26.1	Fibrous, 75 per cent.; granular, 25 per cent.	.15,	.14,	.14,	.16,	.15,	.17,	.19,	.38*,	.26,	.23

TABULATION OF SPECIMENS FROM RAILROAD AXLES—Continued.

WROUGHT-IRON TENDER AXLE, FRACTURED AT INSIDE END OF WHEEL SEAT, IN SERVICE.

No. of test.	Position in axle.	Diameter.	Sectional area.	Elastic limit.		Tensile strength.		Elongation in 6 and 10 inches.		Area at fracture.		Contraction of area.	Appearance of fracture.	Elongation of inch sections.
				Total.	Per square inch.	Total.	Per square inch.	In.	Per cent.					
		Inches.	*Sq. in.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds*				*In. Sq. in.*	*Pr. ct.*		" " " " " " " " "
1641	End	1.0092	.80	17,600	22,000	34,800	43,500	0.78	13.0	Diam.	.92 = .665	16.9	Granular, 90 per cent.; fibrous, 10 per cent.	.09, .14, .11, .21*, .12, .10, .16, .13
1642	...do	1.0092	.80	18,400	23,000	37,080	46,350	0.93	15.5	Diam.	.91 = .650	18.8	Granular, 50 per cent.; fibrous, 50 per cent.	.13, .12, .13, .16, .24*, .16, .12, .09
1643	...do	1.0092	.80	17,200	21,500	36,080	45,100	1.09	18.2	Diam.	.89 = .622	22.2	Fibrous, slightly spongy.	.12, .12, .26*, .23*, .16, .15, .17, .14
1638	Middle..	1.129	1.00	23,000	23,000	46,760	46,760	2.28	22.8	Diam.	.92 = .665	33.5	Fibrous, slightly granular.	.22, .20, .20, .21, .37*, .31*, .21, .21, .18, .17
1639	...do	1.129	1.00	19,000	19,000	47,150	47,150	2.35	23.5	Diam.	.88 = .608	39.2	Fibrous	.21, .20, .19, .21, .51*, .35, .20, .18, .17, .13
1640	...do	1.129	1.00	18,500	18,500	44,900	44,900	1.46	14.6	Diam.	.91 = .650	35.0	Fibrous, seamy	.10, .11, .19, .37*, .14, .12, .11, .10, .11, .11
1644	End	1.0092	.80	15,600	19,500	36,100	45,125	1.61	16.1	Diam.	.81 = .515	35.6	Fibrous, lamellar.....	.10, .13, .16, .21, .25, .36*, .50, .22
1645	...do	1.0092	.80	18,000	22,500	36,580	45,725	1.33	22.2	Diam.	.86 = .581	27.4	Fibrous, 95 per cent.; granular, 5 per cent.	.13, .14, .16, .19, .26, .35*, .23, .14
1646	...do	1.0092	.80	17,600	22,000	36,680	45,850	1.36	22.7	Diam.	.82 = .528	34.0	Fibrous	.21, .18, .15, .15, .18, .24, .46*, .19

FAGOTED WROUGHT-IRON TENDER AXLE, ENGLISH MANUFACTURE.

1613	End	1.129	1.00	20,000	20,000	45,070	45,070	2.74	27.4	Diam.	.87 = .594	40.6	Fibrous, trace of granulation.	.18, .18, .22, .22, .24, .27, .42, .51*, .26, .24
1614	...do	1.129	1.00	19,500	19,500	44,100	44,100	2.75	27.5	Diam.	.89 = .622	37.8	Fibrous	.18, .19, .20, .24, .29, .20, .35, .50*, .28, .26
1615	...do	1.129	1.00	19,500	19,500	44,830	44,830	2.20	22.0	Diam.	.93 = .679	32.1	... do	.19, .15, .49*, .21, .17, .19, .19, .20, .21, .20
1616	Middle..	1.129	1.00	24,000	24,000	44,290	44,290	2.11	21.1	Diam.	.84 = .554	44.6	....do	.11, .12, .12, .12, .13, .15, .20, .41, .52*, .23
1617	...do ...	1.129	1.00	23,500	23,500	44,910	44,910	2.14	21.4	Diam.	.84 = .554	44.6	....do	.12, .13, .13, .11, .13, .15, .20, .29, .58*, .30
1618	...do	1.129	1.00	23,500	23,500	44,860	44,860	2.10	21.0	Diam.	.85 = .567	43.3	....do	.11, .14, .12, .12, .11, .15, .22, .53*, .34, .26
1619	End	1.129	1.00	23,500	23,500	47,380	47,380	2.54	25.4	Diam.	.89 = .622	37.8	Fibrous, 90 per cent.; granular, 10 per cent.	.18, .18, .20, .19, .21, .20, .23, .26, .47*, .42*
1620	...do	1.129	1.00	25,000	25,000	47,090	47,090	2.34	23.4	Diam.	.88 = .608	39.2	Fibrous, interspersed with granulation.	.18, .17, .19, .19, .18, .19, .23, .24, .25, .52*
1621	...do	1.129	1.00	24,000	24,000	46,930	46,930	2.71	27.1	Diam.	.86 = .581	41.9	Fibrous	.27, .29, .37, .50*, .24, .21, .21, .21, .22, .19

SWEDISH IRON TENDER AXLE.

1622	End	1.129	1.00	19,500	19,500	49,580	49,580	2.91	29.1	Diam.	.80=.503	49.7	Fibrous	.21,	.21,	.21,	.29,	.63*,	.38,	.28,	.23,	.23,	.24
1624	...do	1.129	1.00	18,500	18,500	40,800	40,800	2.56	25.6	Diam.	.79=.490	51.0	....do	.22,	.20,	.24,	.34,	.66*,	.27,	.21,	.16,	.14,	.12
1625	...do	1.129	1.00	18,500	18,500	46,720	46,720	2.47	24.7	Diam.	.73=.419	58.1	....do	.72*,	.26,	.21,	.23,	.24,	.20,	.18,	.16,	.14,	.13
1623	Middle..	1.129	1.00	19,000	19,000	48,720	48,720	2.30	23.0	Diam.	.77=.466	53.4	....do	.18,	.25,	.30,	.69*,	.24,	.14,	.13,	.12,	.12,	.13
1626	...do	1.129	1.00	20,000	20,000	50,920	50,920	2.25	22.5	Diam.	.80=.503	49.7	....do	.17,	.17,	.26,	.57*,	.26,	.15,	.15,	.15,	.21,	.22
1627	...do	1.129	1.00	20,000	20,000	48,590	48,590	2.29	22.9	Diam.	.76=.454	54.6	....do	.19,	.20,	.20,	.34,	.58*,	.19,	.17,	.15,	.14,	.13
1628	End	1.129	1.00	17,500	17,500	47,610	47,610	2.14	21.4	Diam.	.73=.419	58.1	....do	.16,	.16,	.16,	.22,	.69*,	.29,	.13,	.11,	.11,	.11
1629	...do	1.129	1.00	17,500	17,500	47,900	47,900	2.17	21.7	Diam.	.77=.466	53.4	....do	.14,	.15,	.15,	.21,	.69*,	.25,	.17,	.14,	.14,	.13
1630	...do	1.129	1.00	17,300	17,300	46,090	46,090	2.70	27.0	Diam.	.77=.466	53.4	....do	.15,	.15,	.15,	.23,	.25,	.20,	.24,	.25,	.58*,	.50*

WROUGHT-IRON PASSENGER AXLE, BRANDED 1871.

1631	End	1.129	1.00	24,000	24,000	46,980	46,980	1.96	19.6	Diam.	.92=.665	33.5	Fibrous.....											
1632	...do	1.129	1.00	21,500	21,500	45,690	45,690	1.87	18.7	Diam.	.98=.754	24.6	....do.....	.23,	.23,	.52*,	.17,	.14,	.14,	.12,	.11,	.11,	.10
1633	.. do	1.129	1.00	23,500	23,500	46,800	46,800	1.41	14.1	Diam.	.98=.754	24.6	....do.....	.10,	.09,	.13,	.12,	.14,	.14,	.14,	.13,	.17,	.25*
1634	Middle .	1.129	1.00	23,500	23,500	46,920	46,920	2.32	23.2	Diam.	.91=.650	35.0	... do.....	.17,	.22,	.22,	.25,	.35,	.44*,	.22,	.17,	.15,	.13
1635	...do	1,129	1.00	23,000	23,000	48,200	48,200	2.04	20.4	Diam.	.95=.709	29.1	Fibrous, 85 per cent.; granular, 15 per cent.	.14,	.19,	.16,	.16,	.18,	.23,	.36*,	.28,	.17,	.17
1636	...do	1.129	1.00	23,500	23,500	42,000	42,000	0.63	6.3	Diam.	1.08=.916	8.4	Granular, fibrous, spongy spot.	.05,	.05,	.05,	.05,	.04,	.13*,	06,	.05,	.04,	.11
1637	End	1.0092	.80	16,800	21,000	35,880	44,850	1.35	22.5	Diam.	.78=.478	40.2	Fibrous.....	.10,	.12,	.12,	.15,	.19,	.41*,	.36,	.22		

MUCK-BAR TENDER AXLE, NO. 5, AFTER HAVING RUN 197,290 MILES.

								Elongation in 10 inches.																
1604	End	1.129	1.00	21,000	21,000	47,410	47,410	2.75	27.5	Diam.	.81=.515	48.5	Fibrous	.18,	.19,	.21,	.25,	.21,	.28,	.26,	.62*,	.35,	.25
1605	...do	1.129	1.00	20,000	20,000	45,200	45,200	2.55	25.5	Diam.	.85=.567	43.3	....do.....	.18,	.19,	.21,	.26,	.74*,	.15,	.24,	.20,	.21,	.17
1606	...do	1.129	1.00	21,500	21,500	46,300	46,300	2.41	24.1	Diam.	.90=.636	36.4	....do.....	.19,	.18,	.16,	.22,	.23,	.26,	.49*,	.27,	.23,	.18
1607	Middle .	1.129	1.00	24,500	24,500	46,090	46,090	2.56	25.6	Diam.	.79=.490	51.0	....do.....	.15,	.20,	.63*,	.35,	.21,	.20,	.19,	.20,	.22,	.18
1608	.. do	1.129	1.00	23,500	23,500	44,980	44,980	2.30	23.0	Diam.	.80=.503	49.7	....do.....	.20,	.35,	.57*,	.24,	.10,	.17,	.16,	.14,	.14,	.13
1609	.. do	1.129	1.00	25,000	25,000	46,280	46,280	2.09	20.9	Diam.	.83=.541	45.9	....do.....	.13,	.12,	.13,	.14,	.15,	.17,	.27,	.57*,	.23,	.18
1610	End	1.129	1.00	21,000	21,000	47,090	47,090	2.46	24.6	Diam.	.88=.608	39.2	Fibrous, seamy; trace of granulation.	.19,	.21,	.22,	.20,	.25,	.47*,	.34,	.20,	.19,	.19
1611	...do	1.129	1.00	22,000	22,000	45,920	45,920	2.40	24.0	Diam.	.89=.622	37.8	Fibrous	.15,	.16,	.16,	.20,	.21,	.25,	.24,	.23,	.20,	.54*
1612	...do	1.129	1.00	21,500	21,500	46,290	46,290	2.27	22.7	Diam.	.88=.608	39.2	... do.....	.14,	.14,	.15,	.22,	.53*,	.29,	.21,	.20,	.19,	.20

TABULATION OF SPECIMENS FROM RAILROAD AXLES—Continued.

MUCK-BAR TENDER AXLE, NO. 6, AFTER HAVING RUN 271,702 MILES.

No. of test.	Position in axle.	Diameter.	Sectional area.	Elastic limit.		Tensile strength.		Elongation in 10 inches.		Area at fracture.		Contraction of area.	Appearance of fracture.	Elongation of inch sections.									
				Total.	Per square inch.	Total.	Per square inch.	In.	Per cent.														
		Inches.	*Sq. in.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*				*In. Sq. in.*	*Pr. ct.*		"	"	"	"	"	"	"	"	"	"
2087	End	.798	.50	10,000	21,000	22,620	45,240	2.03	20.3	Diam.	.66=.342	31.6	Fibrous	.13,	.15,	.17,	.19,	.20,	.42*,	.23,	.22,	.18,	.14
2088	...do	.798	.50	10,500	21,000	23,290	46,580	2.19	21.9	Diam.	.58=.264	47.2	....do.....	.13,	.14,	.15,	.17,	.18,	.18,	.22,	.54*,	.29,	.19
2089	...do	.798	.50	.....	.....	23,600	47,200	2.42	24.2	Diam.	.50=.273	45.4	....do.....	.15,	.16,	.18,	.19,	.21,	.26,	.26,	.52*,	.27,	.22
2093	Middle..	1.129	1.00	26,000	26,000	47,260	47,260	2.47	24.7	Diam.	.82=.528	47.2	....do.....	.19,	.19,	.20,	.20,	.21,	.25,	.64*,	.25,	.18,	.16
2090	En	.798	.50	10,000	20,000	23,240	46,480	1.95	19.5	Diam.	.64=.322	35.6	....do.....	.14,	.15,	.17,	.19,	.20,	.45*,	.26,	.16,	.13,	.10
2091	...do	.798	.50	10,000	20,000	23,000	46,000	2.00	20.0	Diam.	.62=.302	39.6	....do.....	.12,	.16,	.17,	.18,	.48*,	.24,	.19,	.17,	.15,	.14
2092	...do	.798	.50	.....	.....	23,550	47,100	1.92	19.2	Diam.	.63=.312	37.6	Fibrous seamy,.....	.13,	.16,	.16,	.18,	.23,	.49*,	.19,	.16,	.13,	.19

KRUPP STEEL TENDER AXLE.

1647	End	1.129	1.00	46,000	46,000	91,100	91,100	1.10	11.0	Diam.	.91=.650	35.0	Fine granular.....	.08,	.10,	.10,	.10,	.11,	.12,	.12,	.13,	.11,	.13
1648	...do	1.129	1.00	38,500	38,500	86,600	86,600	1.01	10.1	Diam.	.91=.650	35.0	Granular.....	.27,	.19,	.07,	.08,	.08,	.08,	.07,	.06,	.07,	.06
1649	... do	1.129	1.00	37,500	37,500	87,160	87,160	.98	9.8	Diam.	.91=.650	35.0	....do.....	.06,	.06,	.06,	.06,	.07,	.07,	.08,	.07,	.12,	.33*
1650	Middle..	1.129	1.00	38,000	38,000	89,960	89,960	.73	7.3	Diam.	.99=.770	23.0	....do.....	.06,	.06,	.05,	.06,	.06,	.06,	.06,	.05,	.06,	.21*
1651	...do	1.129	1.00	37,000	37,000	88,200	88,200	.87	8.7	Diam.	.98=.754	24.6	....do.....	.06,	.06,	.05,	.06,	.07,	.07,	.05,	.05,	.19,*.21*	
1652	...do	1.129	1.00	36,800	36,800	89,120	89,120	.80	8.0	Diam.	.99=.770	23.0	....do.....	.26*,	.06,	.05,	.06,	.06,	.06,	.06,	.06,	.06,	.07
1653	End	1.129	1.00	40,000	40,000	86,200	86,200	.75	7.5	Diam.	.89=.622	37.7	....do.....	.16,	.07,	.07,	.07,	.06,	.08,	.07,	.05,	.06,	.06
1654	...do	1.129	1.00	40,000	40,000	84,860	84,860	1.05	10.5	Diam.	.87=.594	40.6	Granular, silky center.	.17,	.40*,	.06,	.07,	.06,	.06,	.05,	.06,	.05,	.07
1655	...do	1.129	1.00	39,000	39,000	84,920	84,920	.97	9.7	Diam.	.88=.608	39.2	Fine granular.....	.39*,	.10,	.05,	.08,	.05,	.06,	.06,	.06,	.06,	.06

COMPLETION OF THE TEST OF SPECIMEN 2C FROM MUCK-BAR AXLE NO. 1.

(Test No. 1529. Report 1885, page 1020.)

After a rest of two years and six months, the stem was turned down to the uniform diameter, ".8392 = .553 square inch sectional area.

For the purpose of determining the elongation of the stem in the several original inch sections, these sections were laid off on the stem according to the measurements taken at the close of the original test.

A gauged length of 10" was also laid off on its present size, and observations taken the same as would be done with a new specimen.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
553	1,000	0.	0.	Initial load.
2,765	5,000	.0015	0.	
5,530	10,000	.0033	0.	
8,295	15,000	.0052	0.	
11,060	20,000	.0070	0.	
13,825	25,000	.0089	0.	
15,200	27,490	.0100	0.	
16,590	30,000	.0107	0.	
19,355	35,000	.0125	0.	
22,120	40,000	.0144	0.	
24,885	45,000	.0162	0.	
25,438	46,000	.0166	.....	
25,991	47,000	.0169	.....	
26,544	48,000	.0173	.....	
27,097	49,000	.0177	.....	
27,650	50,000	.0181	.....	
28,203	51,000	.0184	.....	
28,756	52,000	.0187	.....	
29,309	53,000	.0192	.....	
29,862	54,000	.0195	.....	
30,415	55,000	.0200	.....	Stretches at the necks outside the gauged length.
30,691	55,500	.0204	.....	
30,968	56,000	.0207	.....	
31,244	56,500	.0209	.....	
31,521	57,000	.0212	.....	
31,797	57,500	.0220	.....	
32,074	58,000	.....	.....	Tensile strength.
28,100	.....	.....	.....	Load at time of rupture.
0	0	.02	.....	= 0.2 per cent.

Fractured $\frac{7}{8}$" from neck. Appearance, fibrous.

Diameter at fracture, ".67. Area, .353 square inch. Contraction, 36.2 per cent.

No change in the stem except the slight elongation of ".02 above noted; only local contraction of area occurred at the place of rupture.

After the completion of the tensile test the stem of the specimen was bent cold at the place where greatest contraction of area occurred in the original test, which was $10\frac{1}{2}$" from the outside end of the specimen. The stem now bent 45° and then fractured with a fibrous appearance. Another bend was made 6" from the end of the specimen or $2\frac{1}{2}$" from the neck; at this place the metal was bent 180°, showing slight opening on the tension side.

STEEL RAILS.

Transverse and tensile tests of three steel rails. Material and chemical analyses contributed by the Boston and Albany Railroad Company.

Rail branded S. W. steel, 87, was rolled by the Worcester Steel Works, Massachusetts.

The marks on the other rails are self-explanatory.

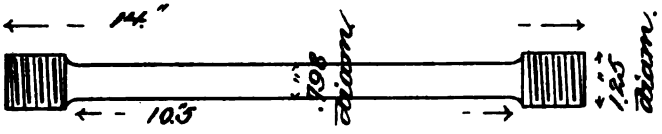
The tensile-test pieces were taken from the ends of the rails after completing the transverse tests.

Chemical analyses made by Dr. T. M. Drown.

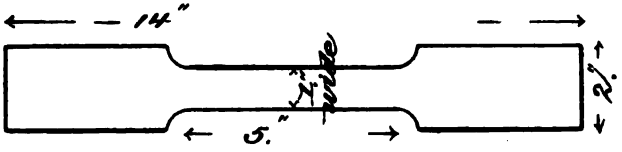
	Scranton Steel Co., 85.	S. W. steel, 87.	Troy Steel and Iron Co., 1887.
Carbon	0.440	0.321	0.408
Manganese	1.501	0.564	0.894
Silicon	0.035	0.030	0.023
Sulphur	0.072	0.078	0.096
Phosphorus	0.053	0.137	0.064
Copper	0.725	0.040	0.239

Forms of tensile specimens from Steel Rails.

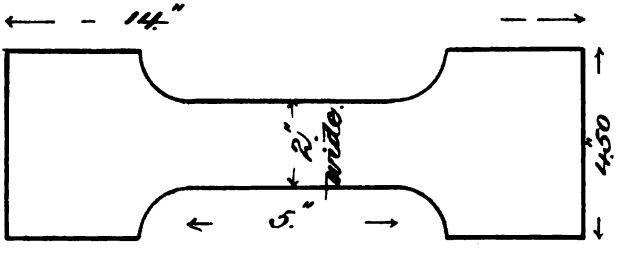
From Heads



From Webs

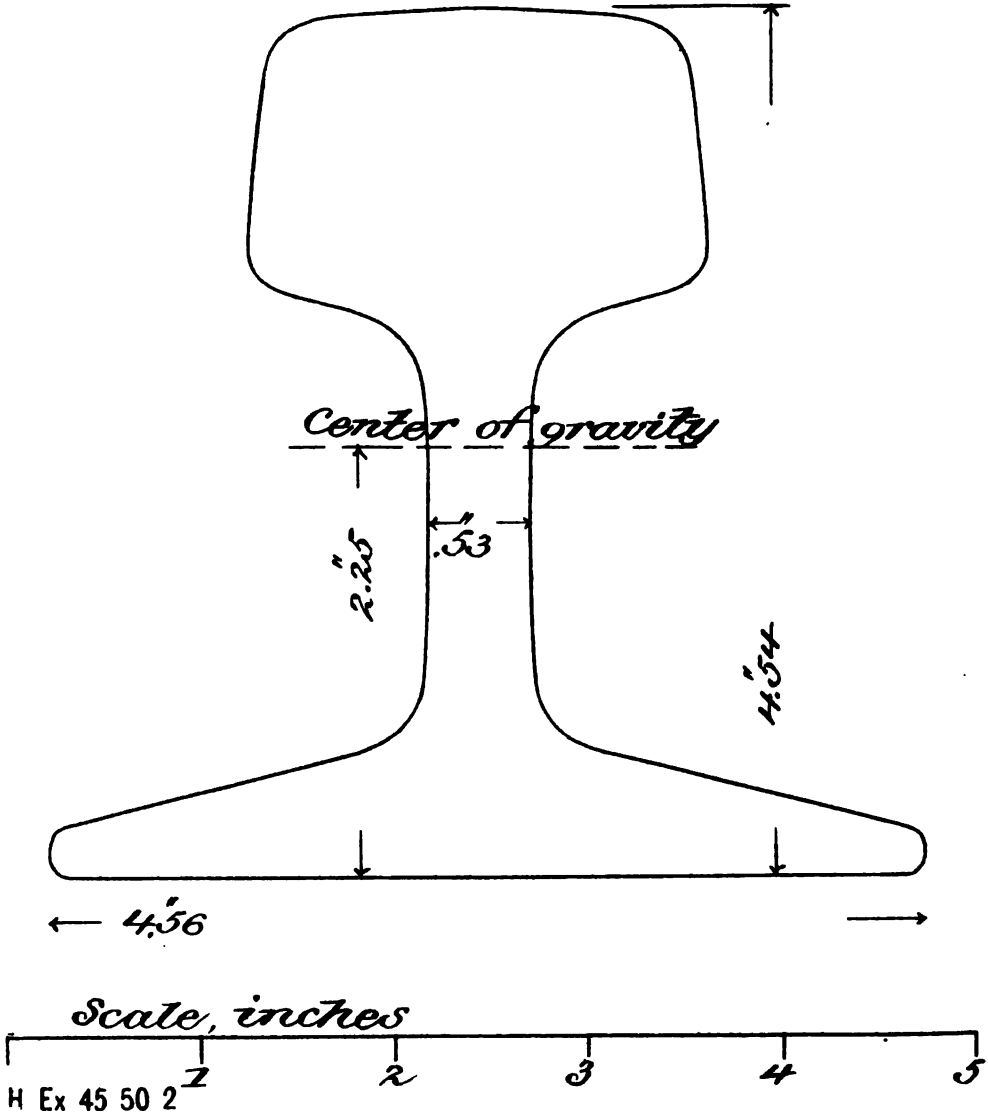


From Flanges



H Ex 45 50 2

Steel rail branded,
Scranton Steel Co 85



H Ex 45 50 2

TRANSVERSE TESTS.

Rails supported at the ends 30″ apart. Loaded at the middle.

No. 37.

Marks, "Scranton Steel Co., 85."
Length of section, 35″.75.
Weight, 71 pounds=71.5 pounds weight per yard.
Hardness at surface of head $\{^{27.65}_{29.22}$

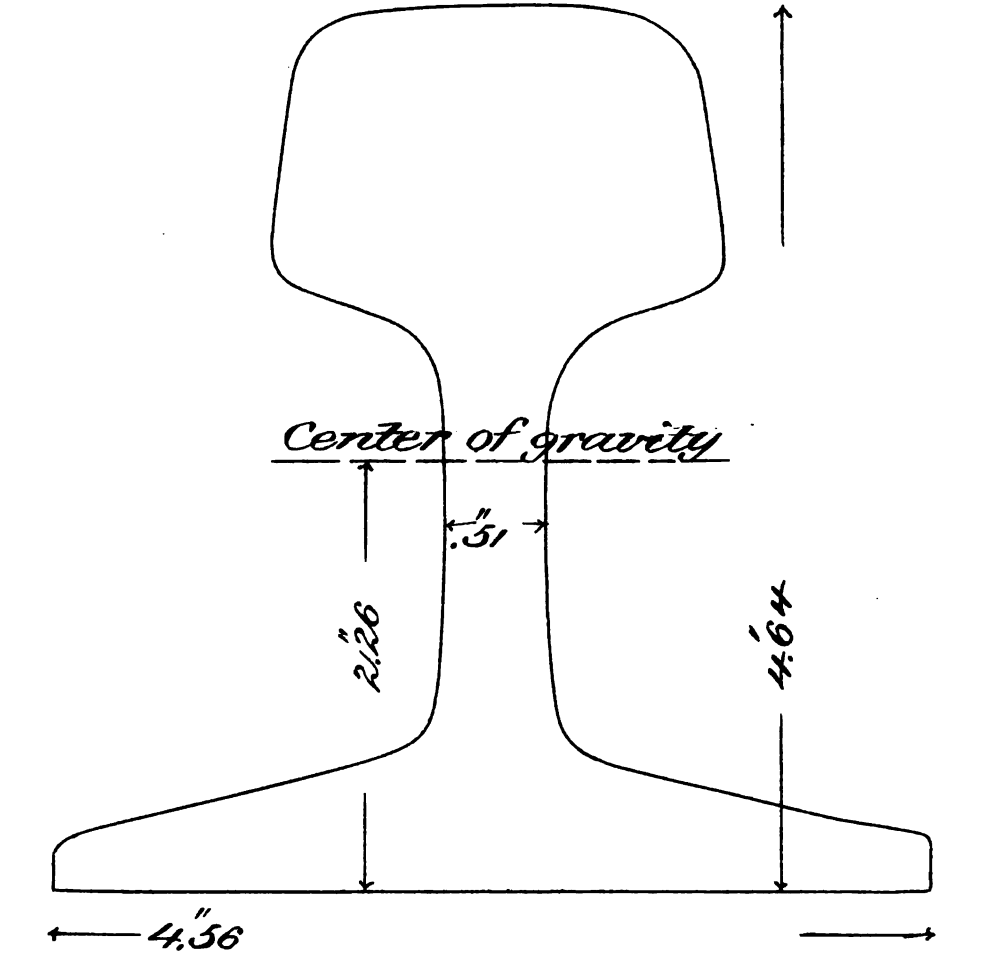
Applied loads.	Deflection.	Successive deflection.	Deflection set.	Remarks.
Pounds.	*Inch.*	*Inch.*	*Inch.*	
2,000	0.	0.	0.	Initial load.
4,000	.0035	.0035	.....	
6,000	.0065	.0030	.....	
8,000	.0093	.0028	.....	
10,000	.0121	.0028	.....	
12,000	.0148	.0027	.....	
14,000	.0177	.0029	.....	
16,000	.0208	.0031	.....	
18,000	.0234	.0026	.....	
20,000	.0264	.0030	.0066	
22,000	.0293	.0029	.....	
24,000	.0320	.0027	.....	
26,000	.0350	.0030	.....	
28,000	.0379	.0029	.....	
30,000	.0408	.0029	.0013	
32,000	.0438	.0030	.....	
34,000	.0464	.0026	.....	
36,000	.0493	.0029	.....	
38,000	.0518	.0025	.....	
40,000	.0547	.0029	.0014	
42,000	.0573	.0026	.....	
44,000	.0601	.0028	.....	
46,000	.0629	.0028	.....	
48,000	.0655	.0026	.....	
50,000	.0685	.0030	.0021	
52,000	.0713	.0028	.....	
54,000	.0742	.0029	.....	
56,000	.0770	.0028	.....	
58,000	.0800	.0030	.....	
60,000	.0830	.0030	.0030	
62,000	.0854	.0024	.....	
64,000	.0884	.0030	.....	
66,000	.0914	.0030	.....	
68,000	.0950	.0036	.....	
70,000	.0978	.0028	.0046	
72,000	.1013	.0035	.....	
74,000	.1042	.0029	.....	Elastic limit.
76,000	.1075	.0033	.....	
	.1081	.0006	.....	After 1 minute.
78,000	.1110	.0029	.....	
80,000	.1142	.0032	.0068	
82,000	.1185	.0043	.....	
84,000	.1216	.0031	.....	
86,000	.1255	.0039	.....	
88,000	.1294	.0039	.....	
	.1340	.0046	.....	
	.1350	.0010	.....	After 1 minute.
	.1353	.0003	.....	After 2 minutes.
90,000	.1356	.0003	.....	After 3 minutes.
	.1359	.0003	.....	After 4 minutes.
	.1360	.0001	.0146	After 5 minutes.
92,000	.1403	.0043	.....	
94,000	.1445	.0042	.....	
96,000	.1506	.0061	.....	
98,000	.1585	.0079	.....	
	.1660	.0075	.....	
	.1680	.0020	.....	After 1 minute.
100,000	.1694	.0014	.....	After 2 minutes.
	.1702	.0008	.....	After 3 minutes.
	.1708	.0006	.....	After 4 minutes.
	.1711	.0003	.0836	After 5 minutes.

No. 37—Continued.

Applied loads.	Deflection.	Successive deflection.	Deflection set.	Remarks.
Pounds.	*Inch.*	*Inch.*	*Inch.*	
104,000	.1870	.0150	.....	
108,000	.2150	.0280	.....	
112,000	.2480	.0330	.....	
116,000	.29	.0420	.....	
120,000	.34	.05	.....	
124,000	.39	.05	.....	
128,000	.45	.06	.....	
132,000	.52	.07	.....	
136,000	.59	.07	.....	
140,000	.67	.08	.....	Test discontinued.

Steel rail branded,

S W Steel 87



Ex 45 50 2

No. 38.

Marks, "S. W. steel, 87."
Length of section, 35′′.40.
Weight, 71 pounds=72.23 pounds weight per yard.
Hardness at surface of head $\begin{cases} 16.73 \\ 16.73 \end{cases}$

Applied loads.	Deflection.	Successive deflection	Deflection set.	Remarks.
Pounds.	*Inch.*	*Inch.*	*Inch.*	
2,000	0.	0.	0.	Initial load.
4,000	.0036	.0036	.....	
6,000	.0063	.0027	.....	
8,000	.0110	.0047	.....	
10,000	.0137	.0027	.0007	
12,000	.0170	.0033	.....	
14,000	.0195	.0025	.....	
16,000	.0225	.0030	.....	
18,000	.0253	.0028	.....	
20,000	.0284	.0031	.0013	
22,000	.0316	.0032	.....	
24,000	.0343	.0027	.....	
26,000	.0375	.0032	.....	
28,000	.0400	.0025	.....	
30,000	.0425	.0025	.....	
32,000	.0454	.0029	.....	
34,000	.0482	.0028	.....	
36,000	.0510	.0028	.....	
38,000	.0539	.0029	.....	
40,000	.0565	.0026	.0022	
42,000	.0598	.0033	.....	
44,000	.0626	.0028	.....	
46,000	.0655	.0029	.....	
48,000	.0686	.0031	.....	
50,000	.0715	.0029	.....	
52,000	.0745	.0030	.....	
54,000	.0774	.0029	.....	Elastic limit.
56,000	.0809	.0035	.....	
	.0813	.0004	.....	After 1 minute.
58,000	.0850	.0037	.....	
60,000	.0890	.0040	.....	
62,000	.0927	.0037	.....	
	.0933	.0006	.....	Do.
	.0939	.0006	.....	After 2 minutes.
	.0941	.0002	.....	After 3 minutes.
	.0942	.0001	.....	After 4 minutes.
	.0943	.0001	.....	After 5 minutes.
64,000	.0980	.0037	.....	
66,000	.1052	.0072	.....	
68,000	.1248	.0196	.....	
70,000	.1600	.0352	.....	
	.1685	.0085	.....	After 1 minute.
	.1730	.0045	.....	After 2 minutes.
	.1742	.0012	.....	After 3 minutes.
	.1758	.0016	.....	After 4 minutes.
	.1773	.0015	.....	After 5 minutes.
72,000	.1847	.0074	.....	
74,000	.2240	.0393	.....	
76,000	.2660	.0420	.....	
78,000	.3140	.0480	.....	
80,000	.3630	.0490	.....	
82,000	.44	.0570	.....	
84,000	.49	.05	.....	
86,000	.56	.07	.....	
88,000	.61	.05	.....	
90,000	.71	.10	.....	Test discontinued.

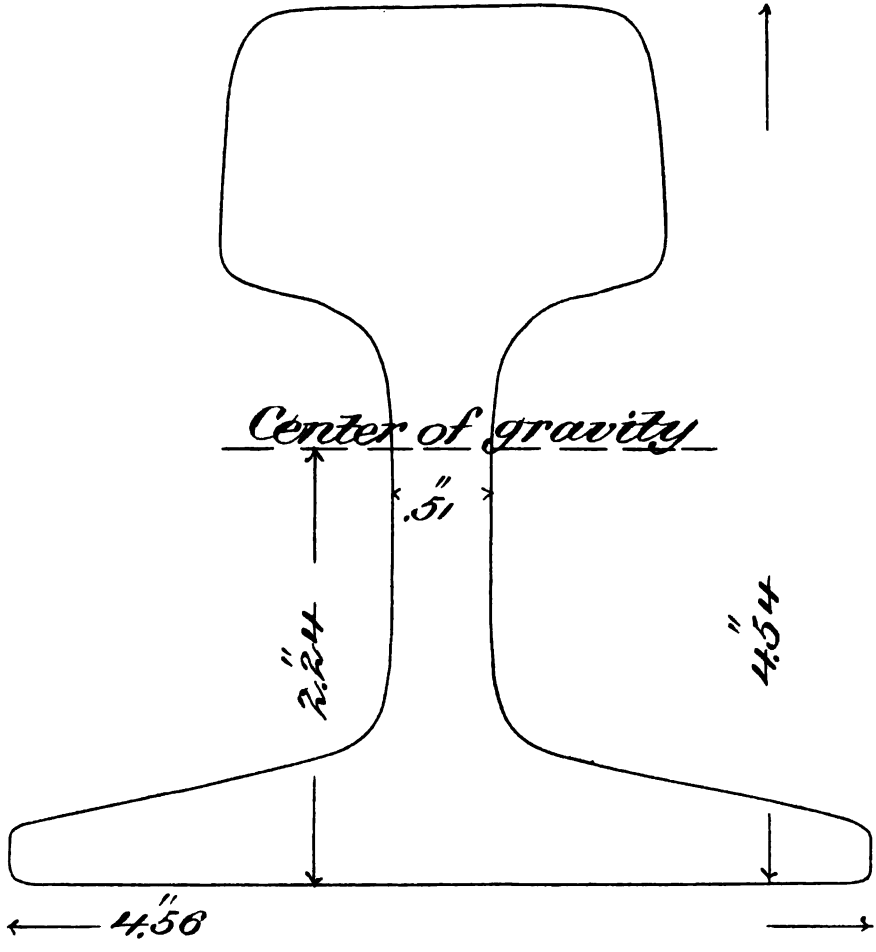
No. 39.

Marks, "Troy S. & I. Co., 1887."
Length of section, 35′′.85.
Weight, 72.5 pounds=72.8 pounds weight per yard.
Hardness at surface of head $\begin{cases} 16.73 \\ 17.62 \end{cases}$

Applied loads.	Deflection.	Successive deflection.	Deflection set.	Remarks.
Pounds.	*Inch.*	*Inch.*	*Inch.*	
2,000	0.	0.	0.	Initial load.
4,000	.0053	.0053		
6,000	.0090	.0037		
8,000	.0123	.0033		
10,000	.0160	.0037	.0014	
12,000	.0193	.0033		
14,000	.0225	.0032		
16,000	.0260	.0035		
18,000	.0290	.0030		
20,000	.0322	.0032	.0030	
22,000	.0355	.0033		
24,000	.0385	.0030		
26,000	.0415	.0030		
28,000	.0450	.0035		
30,000	.0480	.0030		
32,000	.0510	.0030		
34,000	.0540	.0030		
36,000	.0570	.0030		
38,000	.0600	.0030		
40,000	.0630	.0030	.0050	
42,000	.0665	.0035		
44,000	.0700	.0035		
46,000	.0738	.0038		
48,000	.0765	.0032		
50,000	.0800	.0035		
52,000	.0839	.0039		
54,000	.0868	.0029		Elastic limit.
56,000	.0917	.0049		
	.0920	.0003		After 1 minute.
58,000	.0960	.0040		
60,000	.1004	.0044		
	.1012	.0008		Do.
	.1014	.0002		After 2 minutes.
	.1014	0.	.0120	After 3 minutes.
62,000	.1042	.0028		
64,000	.1088	.0046		
66,000	.1155	.0067		
68,000	.1257	.0102		
70,000	.1370	.0113		
	.1426	.0056		After 1 minute.
	.1444	.0018		After 2 minutes.
	.1460	.0016		After 3 minutes.
	.1470	.0010		After 4 minutes.
	.1475	.0005		After 5 minutes.
72,000	.1535	.0060		
74,000	.1785	.0250		
76,000	.2085	.0300		
78,000	.2460	.0375		
80,000	.2690	.0230		
82,000	.3055	.0365		
84,000	.3450	.0395		
86,000	.3810	.0360		
88,000	.4225	.0415		
90,000	.4730	.0505		
92,000	.5180	.0450		
94,000	.5670	.0490		
96,000	.6280	.0610		
98,000	.6820	.0540		
100,000	.7515	.0695	.5932	Test discontinued.

Steel rail branded

Troy S & I Co. 1887



Scale, inches

H Ex 45 50 2

1 2 3 4 5

TENSION TESTS.

Specimens taken from ends of rail sections after having been tested transversely; from heads, webs, and flanges, and marked as follows:
Scranton rail, S.
Worcester rail, W.
Troy rail, T.

No. 1991.

Marks, $\frac{\text{Head}}{S}$
Diameter, ″.798.
Sectional area, .50 square inch.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
500	1,000	0.	0.	Initial load.
2,500	5,000	.0015	0.	
5,000	10,000	.0033	0.	
7,500	15,000	.0049	0.	
10,000	20,000	.0068	0.	
12,500	25,000	.0085	0.	
15,000	30,000	.0101	0.	
17,500	35,000	.0119	0.	
20,000	40,000	.0137	.0001	
22,500	45,000	.0157	.....	
25,000	50,000	.0175	.....	
25,500	51,000	.....	.....	
26,000	52,000	.....	.....	
26,500	53,000	.....	.....	
27,000	54,000	.0194	.....	
27,500	55,000	.0198	.0010	
28,000	56,000	.0205	.....	
28,500	57,000	.0212	.....	Elastic limit.
29,000	58,000	.0228	.....	
29,500	59,000	.0237	.....	
30,000	60,000	.0248	.....	
30,500	61,000	.0275	.....	
31,000	62,000	.0298	.....	
32,000	64,000	.0350	.....	
33,000	66,000	.0430	.....	
34,000	68,000	.0516	.....	
35,000	70,000	.0650	.....	
36,000	72,000	.0775	.....	
37,000	74,000	.0915	.....	
38,000	76,000	.1055	.....	
39,000	78,000	.1195	.....	
40,000	80,000	.1350	.....	
41,000	82,000	.1507	.....	
42,000	84,000	.1675	.....	
43,000	86,000	.1840	.....	
44,000	88,000	.2000	.....	
45,000	90,000	.2200	.....	
46,000	92,000	.235	.....	
47,000	94,000	.265	.....	
48,000	96,000	.28	.....	
49,000	98,000	.31	.....	
50,000	100,000	.33	.....	
51,000	102,000	.36	.....	
52,000	104,000	.39	.....	
53,000	106,000	.42	.....	
54,000	108,000	.47	.....	
55,000	110,000	.52	.....	
56,000	112,000	.58	.....	
57,000	114,000	.70	.....	
58,000	116,000	.92	.....	
58,060	116,120	1.01	.....	Tensile strength.
51,200	.....	.....	.....	At time of fracture.
0	0	1.20	.....	= 12.0 per cent.

Fractured 5″.3 from neck. Appearance, granular, with silky center. Diameter at fracture, ″.65. Area, .332 sq. in. Contraction, 33.6 p. ct. Elongation of inch sections, ″.08, ″.09, ″.10, ″.13, ″.33*, ″.12, ″.10, ″.09, ″.08, ″.08.

No. 1992.

Marks, $\frac{\text{Head}}{W}$
Diameter, ″.798.
Sectional area, .50 square inch.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
500	1,000	0.	0.	Initial load.
2,500	5,000	.0015	0.	
5,000	10,000	.0030	0.	
7,500	15,000	.0048	0.	
10,000	20,000	.0065	0.	
12,500	25,000	.0080	0.	
15,000	30,000	.0098	0.	
17,500	35,000	.0116	.....	
18,000	36,000	.0119	.....	
18,500	37,000	.0124	.....	
19,000	38,000	.0128	.....	
19,500	39,000	.0132	.....	
20,000	40,000	.0137	.0005	
20,500	41,000	.0141	.....	
21,000	42,000	.0147	.....	
21,500	43,000	.0153	.....	Elastic limit.
22,000	44,000	.0167	.....	
22,500	45,000	.0875	.....	
23,000	46,000	.0900	.....	
23,500	47,000	.1030	.....	
24,000	48,000	.1130	.....	
24,500	49,000	.1235	.....	
25,000	50,000	.1345	.....	
26,000	52,000	.1560	.....	
27,000	54,000	.1790	.....	
28,000	56,000	.2050	.....	
29,000	58,000	.2350	.....	
30,000	60,000	.2650	.....	
31,000	62,000	.29	.....	
32,000	64,000	.325	.....	
33,000	66,000	.36	.....	
34,000	68,000	.42	.....	
35,000	70,000	.47	.....	
36,000	72,000	.52	.....	
37,000	74,000	.60	.....	
38,000	76,000	.71	.....	
38,500	77,000	.77	.....	
39,000	78,000	.84	.....	
39,500	79,000	.95	.....	
40,000	80,000	1.12	.....	
40,320	80,640	1.44	.....	Tensile strength.
39,200	.....	.....	.....	At time of fracture.
0	0	1.68	.....	=16.8 per cent.

Fractured 2″.50 from neck. Appearance, granular; dull spot near center; small pieces of the metal detached from the fractured ends at time of fracture.

Diameter at fracture, ″.70. Area, .385 square inch. Contraction, 23.0 per cent.

Elongation of inch sections, ″.14, ″.24*, ″.21*, ″.17, ″.17, ″.17, ″.17, ″.15, ″.14, ″.12.

No. 1993.

Marks, $\frac{\text{Head}}{\text{T}}$
Diameter, ″.798.
Sectional area, .50 square inch.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
500	1,000	0.	0.	Initial load.
2,500	5,000	.0014	0.	
5,000	10,000	.0031	0.	
7,500	15,000	.0048	0.	
10,000	20,000	.0065	0.	
12,500	25,000	.0084	.0002	
15,000	30,000	.0104	.0005	
17,500	35,000	.0127	.....	
18,000	36,000	.0133	.....	
18,500	37,000	.0138	.....	
19,000	38,000	.0143	.....	
19,500	39,000	.0149	.....	
20,000	40,000	.0155	.0024	Elastic limit.
20,500	41,000	.0164	.....	
21,000	42,000	.0174	.....	
21,500	43,000	.0182	.....	
22,000	44,000	.0191	.....	
22,500	45,000	.0208	.0059	
23,000	46,000	.0233	.....	
23,500	47,000	.0278	.....	
24,000	48,000	.0311	.....	
24,500	49,000	.0385	.....	
25,000	50,000	.0455	.....	
26,000	52,000	.0603	.....	
27,000	54,000	.0757	.....	
28,000	56,000	.0934	.....	
29,000	58,000	.1087	.....	
30,000	60,000	.1235	.....	
31,000	62,000	.1421	.....	
32,000	64,000	.1620	.....	
33,000	66,000	.1825	.....	
34,000	68,000	.2020	.....	
35,000	70,000	.2250	.....	
36,000	72,000	.24	.....	
37,000	74,000	.27	.....	
38,000	76,000	.30	.....	
39,000	78,000	.33	.....	
40,000	80,000	.37	.....	
41,000	82,000	.40	.....	
42,000	84,000	.44	.....	
43,000	86,000	.50	.....	
44,000	88,000	.56	.....	
45,000	90,000	.63	.....	
45,500	91,000	.72	.....	
46,000	92,000	.78	.....	
46,500	93,000	.91	.....	
46,680	93,360	.98	.....	Tensile strength.
0	0	.96	.....	= 9.6 per cent.

Fractured 1″.20 from neck. Appearance, granular, dull eccentric spot.

Diameter at fracture, ″.75. Area, .442 square inch. Contraction, 11.6 per cent.

Elongation of inch sections, ″.08, ″.09, ″.09, ″.10, ″.10, ″.09, ″.08, ″.09, ″.12, ″12*.

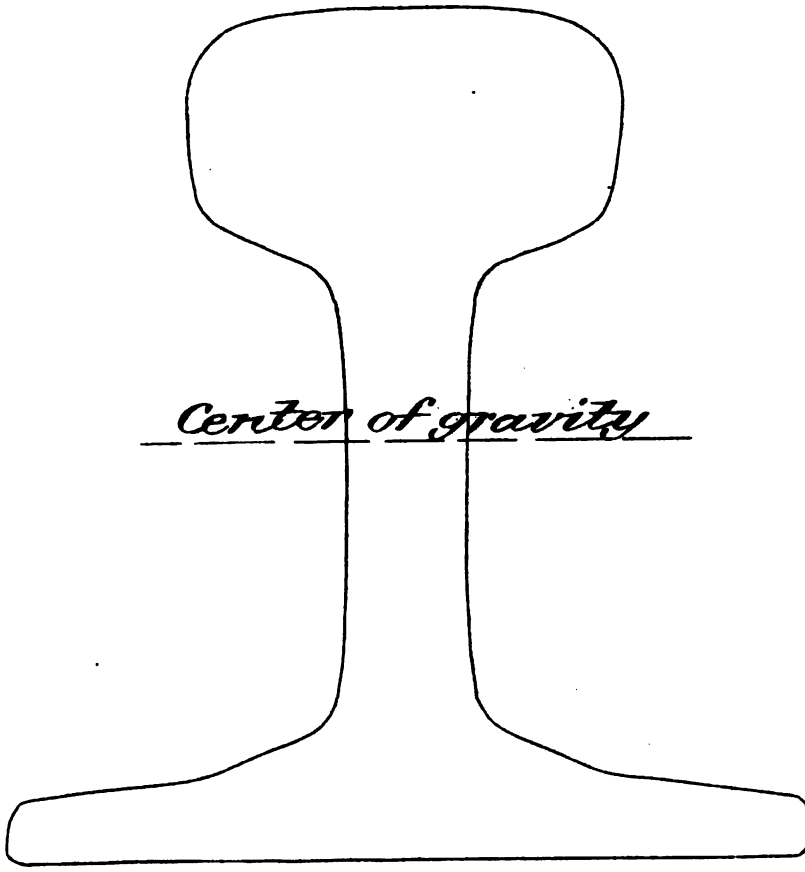
TABULATION OF TENSILE SPECIMENS FROM STEEL RAILS.

No. of test.	Marks.	Dimensions.		Sectional area.	Elastic limit.		Tensile strength.		Elongation in 5 inches.	
		Width.	Thickness.		Total.	Per square inch.	Total.	Per square inch.	Inches.	Per cent.
		Inches.	*Inch.*	*Sq. in.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*		
1994	Web S.....	1.024	.487	.499	34,100	68,340	64,020	128,300	.69	13.8
1995	Web W.....	1.022	.494	.505	24,580	48,670	42,070	83,310	.98	19.6
1996	Web T.....	1.024	.493	.505	24,400	48,320	52,490	103,940	.84	16.8
1997	Flange S....	2.023	.245	.496	34,050	68,650	66,680	134,440	.74	14.8
1998	Flange W ..	2.027	.305	.618	28,680	46,410	54,240	87,770	1.16	23.2
1999	Flange T....	2.030	.320	.650	30,400	46,770	60,940	93,750	1.20	24.0

No. of test.	Marks.	Area at fracture.	Contraction of area.	Appearance of fracture.	Elongation of inch sections.				
		" " *Sq. in.*	*Per cent.*		"	"	"	"	"
1994	Web S.....	.88×.40=.352	29.5	Silky, lamellar, interspersed with fine granulation.	.09	.30",	.11,	.11,	.08
1995	Web W.....	.87×.40=.348	31.1	Silky, lamellar, in part fine granulation.	.15,	.36",	.19,	.16,	.12
1996	Web T	.85×.40=.340	32.7	Silky, slightly granular.	.15,	.33",	.13,	.14,	.09
1997	Flange S....	1.76×.21=.370	25.4	Silky center, granular at edges.	.06,	.30",	.19,	.11,	.06
1998	Flange W ..	1.69×.25=.423	31.5	....do.....	.14,	.22",	.45,	.21,	.14
1999	Flange T...	1.64×.25=.410	36.9	Silky, oblique.....	.16,	.46",	.28,	.17,	.13

Puddled steel rail branded,

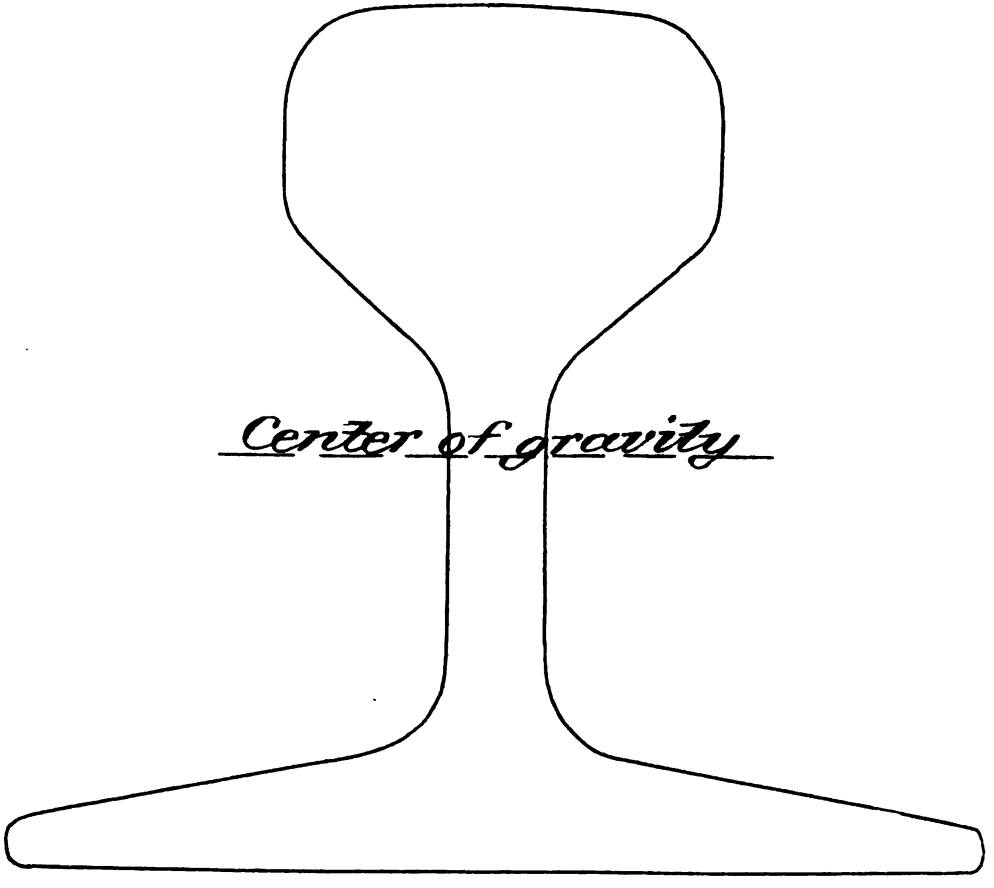
F & E German Steel 1886

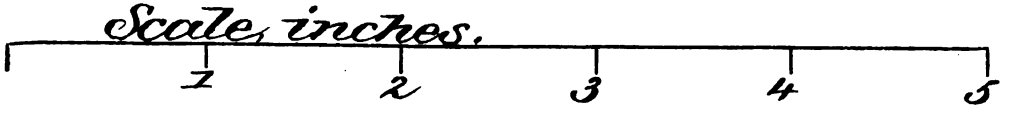


For tests see Report 1887.

H Ex 45 50 2

Steel rail branded,
Scranton 86





For tests see Report 1887

WROUGHT-IRON TIE ROD FROM A RAILWAY TRACK BUFFER.

Specimen turned down from a bar 2″ in diameter which was fractured by a train of cars backing against the buffer, of which this bar formed one of the tie rods.

The buffer was of that type which consists of two horizontal timbers below the track, to which are mortised two upright posts carrying a cross-beam provided with rubber cushions.

The tie rods, which are in an inclined position, being depended upon to give the requisite strength to maintain the upright posts in position.

The tie rod fractured in place with a granular appearance without appreciable contraction of area. It was bent in this vicinity about 20 degrees.

No. 1427.

Bar branded "Best Best Limited."
Length of stem of specimen, 9″.
Diameter, 1″.0092.
Sectional area, .80 square inch.
Gauged length, 6″.
The surface of the specimen was marked by numerous cinder spots, and resembled in appearance the surface of a cast-iron bar.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
800	1,000	0.	0.	Initial load.
4,000	5,000	.0008	0.	
8,000	10,000	.0019	0.	
12,000	15,000	.0031	0.	
15,200	19,000	.0044	.....	
15,600	19,500	.0047	.....	Elastic limit.
16,000	20,000	.0053 .0057	.0016	
16,400	20,500	.0065	.....	
16,800	21,000	.0069	.....	
17,200	21,500	.0073	.....	
17,600	22,000	.0081	.....	
18,000	22,500	.0090	.....	
18,400	23,000	.0100	.....	
19,200	24,000	.0124	.....	
20,000	25,000	.0160	.....	
20,800	26,000	.0232	.....	
21,600	27,000	.0317	.....	
22,400	28,000	.0455	.....	
23,200	29,000	.0660	.....	
24,000	30,000	.0900	.....	
24,650	30,810	.....	.....	Tensile strength.
0	0	.21	.....	=3.5 per cent.

Fractured 2″.75 from neck. Appearance, fibrous, spongy.

Diameter at fracture, ″.98. Area, .754 square inch. Contraction, 5.8 per cent.

Elongation of inch sections, ″.02, ″.04, ″.10*, ″.01, ″.02, ″.03, ″.01, ″.02.

CAR WHEEL—STEEL TIRE.

Specimens taken from two pieces of steel marked *a* and *b*, both from the same tire.

The material came from a steel-tired cast-iron wheel, in the manufacture of which the body of the wheel was cast in the tire.

The tire fractured in service after 420,000 miles run. The immediate cause of the fracture appeared to be the caving in of the tire at a spongy place of junction between the tire and the cast-iron body.

No. 1986.

Tread, *a*.
Diameter, ″.505.
Sectional area, .20 square inch.
Gauged length, 2″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	Initial load.
1,000	5,000	.0002	0.	
2,000	10,000	.0006	0.	
3,000	15,000	.0009	0.	
4,000	20,000	.0013	0.	
5,000	25,000	.0017	0.	
6,000	30,000	.0020	0.	
7,000	35,000	.0023	.....	
8,000	40,000	.0028	.....	
9,000	45,000	.0031	.....	
10,000	50,000	.0037	.0002	Elastic limit.
11,000	55,000	.0044	.....	
12,000	60,000	.0060	.0016	
12,400	62,000	.0068	.....	
12,800	64,000	.0078	.....	
13,200	66,000	.0090	.....	
13,600	68,000	.0101	.....	
14,000	70,000	.0121	.....	
14,400	72,000	.015	.....	Hardness at surface of tread, 39.13.
15,200	76,000	.02	.....	
16,000	80,000	.025	.....	
17,600	88,000	.03	.....	Specific gravity, 7.8520.
18,800	94,000	.04	.....	
20,000	100,000	.05	.....	
20,810	104,050	.....	.....	Tensile strength.
0	0	.05	.....	= 2.5 per cent.

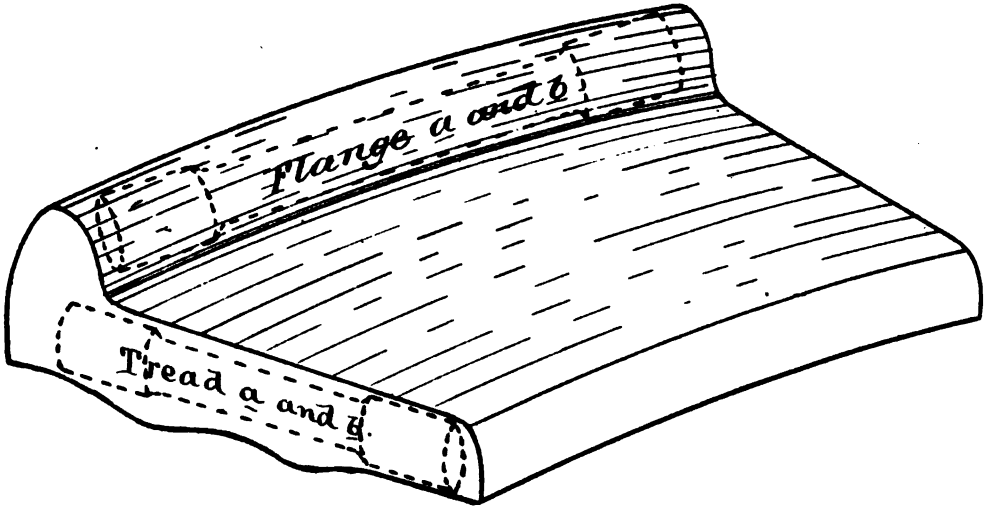
Fractured in the neck of specimen where the diameter was ″.59= .273 square inch sectional area.

Appearance, granular, with a line of fine grained metal across the middle of the surface.

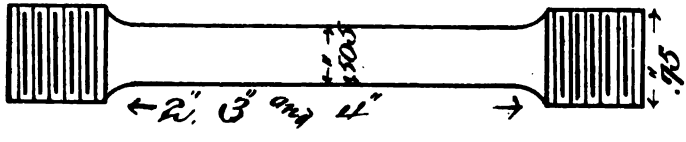
Elongation of inch sections, ″.02, ″.03.

Steel car-wheel tire.

Showing location of specimens.



Form of specimens



H Ex 45 50 2

No. 1987.

Flange, *a*.
Diameter, ″.564.
Sectional area, .25 square inch.
Gauged length, 4″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	Initial load.
1,250	5,000	.0003	0.	
2,500	10,000	.0009	0.	
3,750	15,000	.0016	0.	
5,000	20,000	.0023	0.	
6,250	25,000	.0029	0.	
7,500	30,000	.0037	0.	
8,750	35,000	.0043	0.	
10,000	40,000	.0051	0.	
11,250	45,000	.0057	0.	
12,500	50,000	.0064	0.	
12,750	51,000	.0066	.....	
13,000	52,000	.0069	.....	
13,250	53,000	.0072	.....	
13,500	54,000	.0076	.....	Elastic limit.
13,750	55,000	.0084	.....	
14,000	56,000	.0096	.....	
14,250	57,000	.0112	.....	
14,500	58,000	.0125	.....	
14,750	59,000	.0140	.....	
15,000	60,000	.0155	.0064	
15,500	62,000	.0183	.....	
16,000	64,000	.0213	.....	
16,500	66,000	.0252	.....	
17,000	68,000	.0287	.....	
17,500	70,000	.0330	.....	
18,000	72,000	.0362	.....	
18,500	74,000	.0407	.....	
19,000	76,000	.0450	.....	
19,500	78,000	.0488	.....	
20,000	80,000	.0532	.....	
21,000	84,000	.065	.....	
22,000	88,000	.075	.....	Specific gravity, 7.8460.
23,000	92,000	.09	.....	
24,000	96,000	.10	.....	
25,000	100,000	.115	.....	
26,000	104,000	.13	.....	
27,000	108,000	.15	.....	
28,000	112,000	.18	.....	
29,000	116,000	.21	.....	
30,000	120,000	.29	.....	
30,800	123,200	.40	.....	Tensile strength.
30,700	.....	.....	.....	Load at time of fracture.
0	0	.41	.....	= 10.3 per cent.

Fractured ″.75 from the neck. Appearance, granular.
Diameter at fracture, ″.53. Area, .221 square inch. Contraction, 11.6 per cent.
Elongation of inch sections, ″.07, ″.09, ″.11, ″.14*.

No. 1988.

Tread, *b*.
Diameter, ″.498.
Sectional area, .195 square inch.
Spongy appearance at neck of specimen at end next flange of wheel.
Gauged length, 2″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
195	1,000	0.	0.	Initial load.
975	5,000	.0003	0.	
1,950	10,000	.0007	0.	
2,925	15,000	.0010	0.	
3,900	20,000	.0013	0.	
4,875	25,000	.0016	0.	
5,850	30,000	.0020	0.	Hardness at surface of tread, 32.52.
6,825	35,000	.0023	0.	
7,800	40,000	.0026	0.	
8,775	45,000	.0031	0.	Specific gravity, 7.8494.
9,750	50,000	.0033	0.	
10,140	52,000	.0039	.....	
10,530	54,000	.0040	.....	Elastic limit.
10,926	56,000	.0044	.....	
11,310	58,000	.0050	.....	
11,700	60,000	.0056	.0012	
14,980	76,820	.....	.....	Tensile strength.
0	0	.005	.....	=0.26 per cent.

Fractured in the neck at spongy spot. Appearance, granular.
Diameter at fracture, ″.495. Area, .192 square inch. Contraction, 0.15 per cent.

No. 1988.

Flange, *b*.
Diameter, ".564.
Sectional area, .25 square inch.
Gauged length, 3".

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	Initial load.
1,250	5,000	.0004	.....	
2,500	10,000	.0011	.....	
3,750	15,000	.0016	.....	
5,000	20,000	.0020	.....	
6,250	25,000	.0026	.....	
7,500	30,000	.0031	.....	
8,750	35,000	.0036	.....	
10,000	40,000	.0041	.....	
11,250	45,000	.0046	.....	
12,500	50,000	.0054	.....	
12,750	51,000	.0056	.....	
13,000	52,000	.0059	.....	
13,250	53,000	.0060	.....	Elastic limit.
13,500	54,000	.0065	.....	
13,750	55,000	.0069	.0012	
14,000	56,000	.0079	.....	
14,250	57,000	.0086	.....	
14,500	58,000	.0097	.....	
14,750	59,000	.0107	.....	
15,000	60,000	.0119	.....	
15,500	62,000	.0154	.....	
16,000	64,000	.0175	.....	
16,500	66,000	.0200	.....	
17,000	68,000	.0228	.....	
17,500	70,000	.0251	.....	
18,000	72,000	.0285	.....	
18,500	74,000	.0312	.....	
19,000	76,000	.0350	.....	
19,500	78,000	.0380	.....	
20,000	80,000	.0407	.....	
21,000	84,000	.045	.....	
22,000	88,000	.055	.....	
23,000	92,000	.065	.....	
24,000	96,000	.075	.....	Specific gravity, 7.8460.
25,000	100,000	.08	.....	
26,000	104,000	.09	.....	
27,000	108,000	.105	.....	
28,000	112,000	.13	.....	
29,000	116,000	.15	.....	
30,000	120,000	.19	.....	
30,980	123,920	.....	.....	Tensile strength. Ruptured under the maximum load.
0	0	.25	.....	=8.3 per cent.

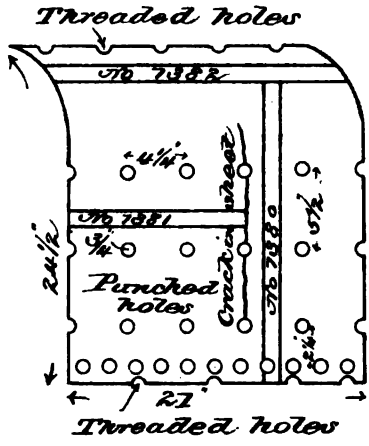
Fractured ".85 from neck. Appearance, granular.
Diameter at fracture, ".54. Area, .229 square inch. Contraction, 8.4 per cent.
Elongation of inch sections, ".07, ".08, ".10*.

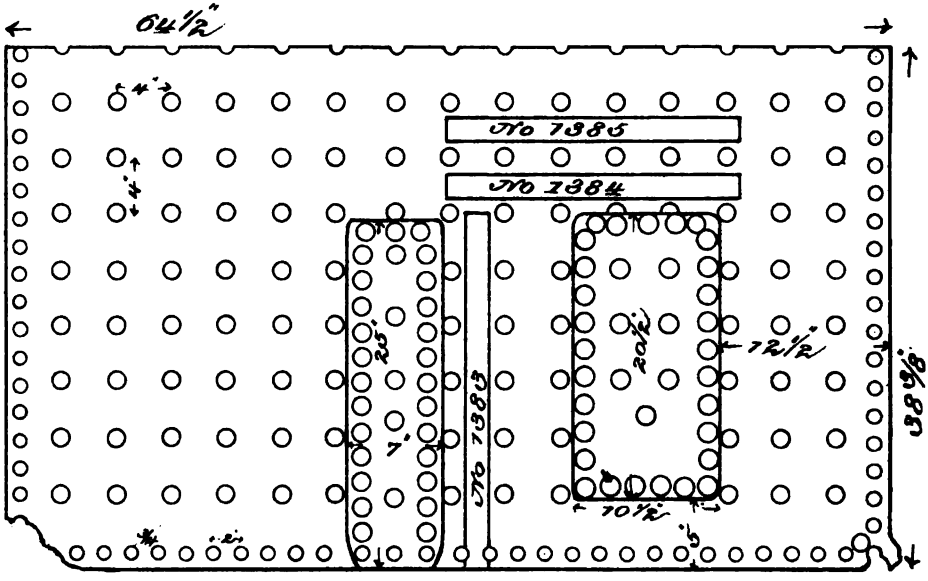
STEEL FROM OLD LOCOMOTIVE FIRE-BOX. ALSO, SPECIMENS FROM TWO NEW STEEL PLATES.

The old fire-box sheets had both cracked in service; the larger sheet had been repaired by two patches, which covered the cracks.

The tensile specimens were taken as indicated by the drawing from the sheets in the vicinity of the cracks.

From the smaller sheet pieces of the metal were taken which had the surface of the crack in their edges. These were bent cold 180° without rupture.


Threaded holes
No 7382
4 1/4"
No 7381
3/4"
24 1/2"
Punched holes
Crack in sheet
No 7380
5 1/2"
2 1/4"
21"
Threaded holes


64 1/2"
4"
4"
No 7385
No 1384
25"
7"
No 7383
20 1/2"
12 1/2"
10 1/2"
38 3/8"

H Ex 45 50 2

SPECIMENS FROM SIDE SHEETS OF OLD LOCOMOTIVE FIRE-BOX.

No. of test.	Mark on specimen.	Dimensions in inches.		Sectional area.	Elastic limit.		Ultimate strength.		Elongation in 4 and 10 inches.		Area at fracture.	Contraction of area.	Appearance of fracture.	Elongation of 1-inch sections.
		Width.	Thickness.		Total.	Per square inch.	Total.	Per square inch.	Inches.	Per cent.				
				Sq. in.	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*			" " *Sq. in.*	*Per ct.*		" " " " " " " " " "
1380	1	.999	.358	.358	14,250	39,800	23,400	65,360	2.03	20.3	.72×.22=.158	55.9	Silky, lamellar..	.13, .10, .56, .23, .16, .18, .17, .15, .14, .12
1381	2	1.005	.362	.362	.....	.....	22,520	62,210	1.12	28.0	.72×.22=.158	56.4	....do	.24, .56, .17, .15
1382	3	1.020	.355	.355	15,620	44,000	22,980	64,730	1.19	11.9	.76×.21=.160	54.9	....do	.18, .20, .16, .14, .11, .09, .10, .06, .08, .07
1383	1	1.595	.375	.598	26,300	42,310	33,280	55,650	.53	5.3	1.17×.21=.246	58.9	Silky	.04, .05, .03, .05, .04, .06, .04, .05, .06, .11
1384	2	1.615	.353	.570	22,550	39,560	32,780	57,510	1.03	10.3	1.17×.21=.246	56.8	.. do	.12, .12, .14, .10, .10, .09, .09, .10, .07, .10
1385	3	1.602	.350	.561	20,900	37,250	31,520	56,190	1.22	12.2	1.19×.19=.226	59.7	....do	.21, .15, .12, .14, .10, .11, .13, .08, .09, .09

NEW STEEL PLATES.

									Elongation in 4 and 9 inches.					
1386	Small plate.	.980	.315	.309	.....	.....	18,510	59,900	.70	17.5	.09×.18=.124	59.9	Silky	.22, .16, .17, .15
1387	Large plate.	1.500	.512	.768	23,300	30,340	41,180	53,620	1.87	20.8	1.08×.33=.356	53.6	....do	.22, .23, .23, .22, .24, .24, .19, .15, .15

CHAIN CABLE AND CHAIN IRON TESTED FOR THE BUREAU OF EQUIPMENT, BOSTON NAVY-YARD.

SAMPLES OF IRON FROM WHICH CHAIN WAS MADE. EACH ABOUT 5 FEET LONG.

No. of test.	Mark on specimen.	Diameter.	Sectional area.	Elastic limit.		Ultimate strength.		Elongation in 30 inches.		Area at fracture.	Contraction of area.	Appearance of fracture.	Elongation of 5-inch sections.
				Total.	Per square inch.	Total.	Per square inch.	Inches.	Per cent.				
		Inches.	*Sq. in.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*			*Inches. Sq. in.*	*Per ct.*		" " " " " "
1672	1	2.02	3.20	93,700	29,280	164,900	51,530	7.12	23.7	1.56 diam. = 1.91	40.3	Fibrous	1.11, 1.05, 1.03, 1.08, 1.17, 1.68*
1673	2	1.77	2.46	72,550	29,480	127,280	51,740	5.95	19.8	1.37 diam. = 1.47	40.2	....do	.92, .88, .87, .92, 1.02, 1.34*
1674	3	1.52	1.81	50,100	27,680	87,500	48,340	6.98	23.3	1.17 diam. = 1.07	40.9	... do	1.09,1.61*, 1.03, 1.04, 1.07, 1.14
1674*a*	3	1.52	1.81	50,480	27,890	89,820	49,630	6.06	20.2	1.26 diam. = 1.25	30.9	Fibrous; opened cracks in surface.	.83, .88, .97,1.30*, 1.04, 1.04
1675	4	1.38	1.50	48,050	32,030	76,560	51,040	7.42	24.7	1.02 diam. = .82	45.3	Fibrous	1.01, 1.37,1.85*, 1.14, 1.02, 1.03
1676	5	1,27	1.27	42,400	33,380	63,480	49,990	6.91	23.0	.92 diam. = .66	48.0	....do	1.16, 1.81, 1.10, 1.01, .98, .85
1677	6	1.14	1.02	33,900	33,230	52,620	51,590	7.42	24.7	.87 diam. = .59	42.1	....do	1.09,1.59*, 1.22, 1.10, 1.35, 1.07

TEST OF THE CHAIN. THREE STUDDED LINKS IN EACH SAMPLE, WITH END LINKS OF LARGER IRON.

No. of test.	Marks.	Diameter of chain.	Sectional area.	Tensile strength.		Remarks.	Efficiency of chain.
				Total.	Per square inch.		
		Inches.	*Sq. in.*	*Pounds.*	*Pounds.*		*Per cent.*
1678	1	2.00	6.28	178,000	28,340	Fractured end link, 2¼″ diameter	55.0
	Retest with new end link.....			209,800	33,410	Fractured middle link at weld	64.8
1679	2	1.75	4.81	187,000	38,880	Fractured end link, 1″.7 diameter	75.1
1680	3	1.50	3.53	108,300	30,680	Fractured middle link at weld	63.5
1681	5	1.25	2.45	83,300	34,000	.....do	66.0
1682	6	1.00	1.57	45,200	27,520	.....do	53.3

WROUGHT-IRON CHAIN CABLE FOR U. S. LIGHT-HOUSE BOARD, THIRD DISTRICT.

Samples consist of three studded links, with end links $2\frac{1}{8}$" diameter.
Length of samples from center to center of $3\frac{3}{16}$" pins for holding end links in the testing machine, 3 feet 2 inches.
Diameter of iron, 2".
Sectional area, 6.28 square inches.
Studs branded "C. & H. Trenton."

No. 2015.—*Sample* 1.

Tensile strength, 213,200 pounds = 33,950 pounds per square inch.
Fractured middle link at welded end. Appearance, granular in part, and in part followed scarf of weld. Started weld in first link.

No. 2016.—*Sample* 2.

Applied loads.		Elongation, center to center, of pins.	Remarks.
Total.	Per square inch.		
Pounds.	*Pounds.*	*Inches.*	
10,000	.....	0.	Initial load.
20,000	.....	.03	
30,000	.....	.08	
40,000	.....	.11	
50,000	.....	.14	
60,000	.....	.18	
70,000	.....	.22	
80,000	.....	.27	
90,000	.....	.33	
95,000	.....	.39	
100,000	.....	.43	
10,000	.....	.31	
110,000	.....	.52	
120,000	.....	.62	
130,000	.....	.74	
140,000	.....	.89	
150,000	.....	1.07	
160,000	.....	1.35	
170,000	.....	1.70	
180,000	.....	2.00	
190,000	.....	2.35	
200,000	.....	2.75	
10,000	.....	2.56	
202,000	32,170	2.85	Tensile strength.

Fractured first link at weld and butt. Appearance, granular, 90 per cent.; fibrous, 10 per cent.

No. 2017.—*Sample* 3.

Applied loads.		Elongation, center to center, of pins.	Remarks.
Total.	Per square inch.		
Pounds.	*Pounds.*	*Inches.*	
10,000	.....	0.	Initial load.
20,000	.....	.03	
30,000	.....	.07	
40,000	.....	.10	
50,000	.....	.13	
60,000	.....	.16	
70,000	.....	.20	
80,000	.....	.24	
90,000	.....	.33	
100,000	.....	.42	
10,000	.....	.31	
110,000	.....	.54	
120,000	.....	.64	
130,000	.....	.75	
140,000	.....	.88	
150,000	.....	1.07	
160,000	.....	1.35	
170,000	.....	1.67	
177,000	.....	.....	Snapping sounds, which were repeated at intervals during the remainder of the test.
180,000	.....	1.98	
190,000	.....	2.35	
200,000	.....	2.77	
210,000	33,440	3.35	Tensile strength.

Fractured middle link through each quarter at welded end. Appearance, granular.

No. 1990.

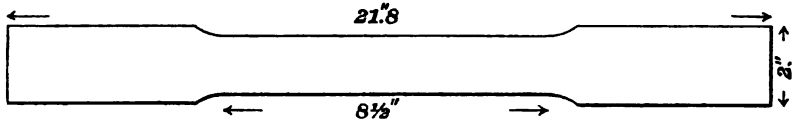
Three studded links with end links $2\frac{3}{8}$" diameter.
Diameter of iron, 1".98.
Sectional area, 6.158 square inches.
Tensile strength, 205,700 pounds=33,400 pounds per square inch.
Fractured middle link; a piece of the iron 4" long pulled off the end of the link. Appearance, granular.
Other granular fractures were started in the end which parted; also in the opposite end of the link.
Snapping sounds were heard at 162,000 pounds tension, which were repeated at frequent intervals during the remainder of the test.

Three studded links, 2" diameter of iron.
Studs branded "J. B. C. & Co., Proved."
End links $2\frac{1}{8}$" diameter.
Sectional area of chain, 6.28 square inches.
Tensile strength, 237,100 pounds=37,760 pounds per square inch.
Fractured the first studded link at the welded end. Appearance, fibrous, 60 per cent.; granular, 40 per cent.
The studs in each link cracked, and a crack was started in the quarter of the middle link.

BESSEMER STEEL PLATE.

[Specimens received from the commanding officer, National Armory, Springfield, Mass.]

Form of specimens.



No. of test.	Mark on specimen.	Dimensions.		Sectional area.	Elastic limit.		Ultimate strength.		Elongation in 8 inches.		Area at fracture.	Contraction of area.	Appearance of fracture.	Elongation of 1-inch sections.							
		Width.	Thickness.		Total.	Per square inch.	Total.	Per square inch.	Inches.	Per cent.											
		Inches.	*Inches.*	*Sq. in.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*			" × " = *Sq. in.*	*Per ct.*		"	"	"	"	"	"	"	"
1684	1 R	1.497	.281	.421	18,520	43,990	27,920	66,320	1.69	21.1	1.24 × .21 = .260	38.2	Silky	.44*	.24	.18	.16	.18	.18	.18	.13
1685	2 R	1.497	.260	.389	18,120	45,730	25,170	64,700	2.09	26.1	1.15 × .18 = .207	46.8	Silky, slightly lamellar.	.21	.25	.53*	.33	.21	.20	.18	.18
1686	3 R	1.497	.265	.397	17,830	44,9 0	25,090	64,710	1.90	23.8	1.14 × .18 = .205	48.4	Silky	.24	.57*	.22	.20	.17	.17	.15	.18
1687	4 R	1.494	.264	.394	18,370	46,630	25,760	65,380	2.02	25.2	1.14 × .18 = .205	48.0	do	.19	.21	.25	.58*	.28	.19	.17	.15
1688	5 R	1.495	.255	.381	17,650	46,330	24,860	65,300	2.09	26.1	1.14 × .16 = .182	52.2	do	.21	.21	.29	.59*	.21	.19	.19	.20
1689	6 R	1.496	.265	.396	18,240	46,060	26,040	65,760	2.17	27.1	1.14 × .18 = .205	48.2	Silky, lamellar	.19	.19	.20	.24	.57*	.33	.25	.20
1690	7 R	1.487	.259	.385	17,860	46,300	25,360	65,870	1.89	23.6	1.15 × .18 = .207	46.2	Silky	.21	.55*	.25	.19	.17	.15	.19	18
1691	8 R	1.489	.257	.383	17,370	45,350	24,890	64,990	1.87	23.4	1.14 × .17 = .194	49.3	do	.30	.54*	.20	.19	.17	.17	.14	.16
1692	9 R	1.481	.264	.391	17,520	44,810	25,410	64,990	1.87	23.4	1.18 × .18 = .212	45.8	do	.19	.10	.21	.51*	.22	.19	.19	.17
1693	10 R	1.483	.261	.387	17,090	44,160	25,160	65,010	2.11	26.4	1.20 × .17 = .204	47.3	do	.16	.15	.21	.35	.47*	.27	.26	.24
1694	11 R	1.492	.255	.380	17,440	44,720	24,570	63,000	1.93	24.1	1.20 × .15 = .180	52.6	do	.22	.31	.48*	.22	.20	.17	.17	.16
1695	12 R	1.500	.263	.395	17,670	44,730	25,480	64,510	1.90	23.8	1.14 × .17 = .194	50.4	do	.26	.56*	.21	.17	.17	.15	.15	.23
1696	13 RL	1.500	.242	.363	17,800	49,280	23,020	63,420	1.89	23.6	1.20 × .15 = .180	50.4	do	.19	.38	.44*	.21	.19	.16	.16	.16
1697	14 L	1.493	.266	.397	17,530	44,160	24,720	62,270	2.05	25.6	1.17 × .17 = .199	49.9	do	.35	.49*	.22	.22	.20	.19	.20	.18
1698	15 L	1.498	.261	.391	17,610	45,040	25,370	64,890	1.93	24.1	1.14 × .17 = .194	50.4	do	.23	.51*	.30	.20	.18	.16	.18	.17
1699	16 L	1.497	.244	.365	17,070	46,770	24,030	65,840	1.91	23.9	1.17 × .15 = .176	51.8	do	.18	.19	.17	.18	.18	.30	.52*	.19
1700	17 L	1.488	.261	.388	17,520	45,160	25,220	65,000	1.78	22.3	1.17 × .17 = .199	48.7	do	.53*	.22	.18	.20	.16	.17	.15	.17
1701	18 L	1.497	.260	.389	16,860	43,340	22,080	56,760	1.82	22.8	1.21 × .18 = .218	44.0	do	.17	.22	.54*	.21	.18	.16	.16	.18
1702	19 L	1.498	.251	.376	19,370	51,520	25,320	67,340	1.70	22.4	1.20 × .17 = .204	35.4	do	.28	.50*	.19	.17	.17	.17	.15	.16
1703	20 L	1.485	.259	.385	17,130	44,490	24,080	64,100	1.77	22.1	1.13 × .17 = .192	50.1	do	.33	.53*	.20	.16	.13	.18	.14	.15
1704	21 L	1.490	.256	.381	18,310	48,060	23,590	61,920	1.99	24.9	1.15 × .17 = .196	48.6	do	.21	.57*	.25	.20	.22	.19	.19	.16
1705	22 L	1.492	.255	.381	15,980	41,940	23,440	61,520	2.34	29.2	1.15 × .15 = .173	54.6	do	.22	.58*	.32	.26	.27	.26	.22	.21
1706	23 L	1.487	.259	.385	18,570	48,230	25,710	66,780	1.85	23.1	1.15 × .15 = .173	55.1	do	.22	.55*	.26	.18	.16	.16	.16	.17
1707	24 L	1.493	.261	.390	16,960	43,540	24,700	63,330	1.54	19.2	1.10 × .16 = .180	52.3	do	.52*	.26	.17	.13	.12	.12	.10	.12
1708	25 L	1.492	.258	.385	17,270	44,860	24,530	63,710	2.04	25.5	1.13 × .18 = .203	47.3	Silky; trace of lamination.	.17	.16	.17	.20	.24	.23	.53*	.34

TENSILE TESTS OF STEEL PLATES FOR THE STEEL INSPECTION BOARD, U. S. NAVY DEPARTMENT.

Mark on specimen.	Dimensions.		Sectional area.	Elastic limit.		Ultimate strength.		Elongation in 8 inches.		Area at fracture.	Contraction of area.	Appearance of fracture.	Elongation of 1-inch sections.
	Width.	Thickness.		Total.	Per square inch.	Total.	Per square inch.	Inches.	Per cent.				
	Inches.	*Inch.*	*Sq. in.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*			" " □"	*Per ct.*		" " " " " " " "
A_3	1.430	.373	.533	16,680	31,290	27,360	51,330	2.59	32.4	1.01×.21=.212	60.2	Silky	.23, .24, .24, .24, .29, .74,* .34, .27
B_3	1.450	.373	.541	17,370	32,110	27,710	51,220	2.38	29.8	1.02×.21=.214	60.4	Silky; trace of lamination	.52,* .52,* .26, .25, .22, .23, .20, .18
C_3	1.435	.372	.534	16,750	31,370	27,350	51,220	2.56	32.0	.99×.21=.208	61.0	Silky, slightly lamellar	.23, .25, .40, .69,* .27, .22, .24, .26
D_3	1.422	.372	.529	16,620	31,420	27,190	51,400	1.99	24.9	1.01×.21=.212	59.9	Silky	.39, .27, .26, .24, .20, .20, .20, .23
E_3	1.454	.371	.539	17,130	31,780	27,980	51,910	2.53	31.6	1.04×.21=.218	59.5	....do	.27, .63,* .42, .26, .25, .24, .22, .24
F_3	1.432	.370	.530	17,080	32,230	27,120	51,170	2.72	34.0	.99×.21=.208	60.7	....do	.33, .25, .32, .69,* .25, .25, .28, .35

STEEL PIANO WIRES.

Observations were made at the piano manufactory of Messrs. Chickering & Sons, Boston, Mass., on the stresses on certain wires.

Grand piano No. 28639 was an instrument about 20 years old, which was at the factory for the purpose of being restrung.

The wires upon which the observations were made are believed to be the original wires which have been in use since the piano was new.

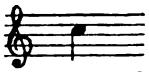
The stresses under which they vibrated were determined by means of a micrometer attached to the wire when the latter was in tune; the tension was released and the amount of resilience displayed was measured by the micrometer.

The resilience thus determined was the basis for ascertaining the stress by comparison of corresponding strains when loaded in the testing machine, and from the modulus of elasticity determined by the tensile tests.

Observations were made on wires in two new pianos which were constructed with what are designated by the manufacturers as scales 105A and 105B.

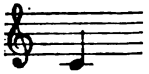
Wires from grand piano No. 28639 were tested in the condition they were taken from the instrument, also the same wires were annealed by heating them red-hot by slowly passing them through the flame of a Bunsen burner.

WIRES FROM OLD GRAND PIANO NO. 28693.

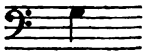
The mean of seven observations on the first wire of 

showed a modulus of elasticity of 29,240,000 pounds for a range in total stress of 50 pounds between 28 and 78 pounds.

Applying this modulus to the observed resilience of the wire in the piano, *i. e.* ".0255 in 6" length, the stress the wire vibrated under in the piano equals 124,270 pounds per square inch, or 138 pounds total stress, the piano being tuned at standard pitch.

The mean of eight observations on the first wire of 

showed a modulus of elasticity of 28,905,000 pounds for a range of total stress of 50 pounds tension between 30 and 80 pounds; hence the resilience of the wire in the piano, ".0212 in 6" length, corresponded to a stress of 102,131 pounds per square inch, or 113 pounds total stress, with piano tuned at standard pitch, and 90,570 pounds per square inch, or 100 pounds total stress, on same wire tuned at French pitch, where the resilience observed in wire was ".0188 in 6" length.

The mean of eight observations on the first wire of 

showed a modulus of elasticity of 29,424,000 pounds for a range in tota stress of 70 pounds tension between 30 and 100 pounds; hence the resi ience observed in the wire when in the piano, ".0216 in 6" length, co responds to a stress of 105,926 pounds per square inch, or 129 pound total stress.

NEW GRAND PIANO, 105A SCALE.

The resilience found in middle C wire was ".0259 in 6" length, when tuned at French pitch.

The diameter of wire is ".0413 = .00134 square inch sectional area.

Assuming the modulus of elasticity of the wire to be 30,000,000 pounds, and applying it to the resilience found, the stress the wire vibrated under in the piano equals 129,500 pounds per square inch, or 174 pounds total stress.

NEW GRAND PIANO, 105B SCALE.

The resilience found in middle C was ".0298 in 6" length, when tuned at French pitch.

The diameter of wire is ".0406 = '.00129 square inch sectional area.

Assuming the modulus of elasticity of the wire to be 30,000,000 pounds, and applying it to the resilience found, the stress the wire vibrated under in the piano equals 149,000 pounds per square inch, or 192 pounds total stress.

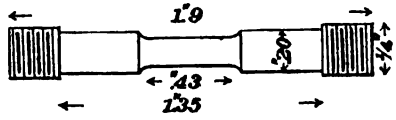
TENSILE TESTS OF THE WIRES FROM GRAND PIANO NO. 28639.

No. of test.	Description.	Diameter.	Sectional area.	Elastic limit.		Tensile strength.		Elongation in 10 inches.		Area at fracture.	Contraction of area.	Appearance of fracture.	Remarks.
				Total.	Per square inch.	Total.	Per square inch.	Inch.	Per cent.				
		Inch.	*Sq. in.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*			*In. Sq. In.*	*Per ct.*		
1577	First wire	.0394	.00122	.....	.....	359	294, 260	.....	.....	Diam. .030=.00071	41.8	Fine silky..	Broke in the jaws.
1578	Same annealed	.0394	.00122	97	79, 510	125	102, 460	.06	0.6	Diam. .026=.00053	56.6	....do.....	Broke outside 10″ section.
1579	Second wire	.0394	.00122	.....	.....	353	289, 340	.....	.....	Diam. .030=.00071	41.8	....do.....	Broke in the jaws.
1580	Same annealed	.0394	.00122	98	80, 330	132	108, 200	.....	.....	Diam. .025=.00049	59.8	....do.....	Do.
1581	Third wire	.0394	.00122	.....	.....	392	321, 310	.....	.....	Diam. .027=.00057	53.3	....do.....	Do.
1582	Same annealed	.0394	.00122	115	94, 260	153	125, 410	.....	.....	Diam. .025=.00049	59.8	....do.....	
1583	First wire	.0376	.00111	.....	.....	309	278, 380	.....	.....	.....	.....	.....	
1584	Same annealed	.0376	.00111	97	87, 390	107	96, 400	.....	.....	Diam. .026=.00053	52.3	Fine silky..	Do.
1585	Second wire	.0376	.00111	.....	.....	339	305, 410	.04	0.4	Diam. .029=.00066	40.5	....do.....	Do.
1586	Same annealed	.0376	.00111	96	86, 490	129	116, 220	.25	2.5	Diam. .023=.00042	62.2	....do.....	
1587	Third wire	.0376	.00111	.....	.....	332	299, 100	.02	0.2	Diam. .028=.00062	44.1	....do.....	Do.
1588	Same annealed	.0376	.00111	110	99, 100	131	118, 020	.12	1.2	Diam. .025=.00049	55.8	....do.....	Do.
1589	First wire	.0376	.00111	.....	.....	331	298, 200	Inappreciable		Diam. .030=.00071	36.0	....do.....	Do.
1590	Second wire	.0376	.00111	.....	.....	330	297, 300	.....	.....	Diam. .028=.00062	44.1	....do.....	Do.
1591	Third wire, Annealed	.0376	.00111	93	.....	135	121, 620	.16	1.6	Diam. .025=.00049	55.8	....do.....	

TENSION TESTS OF LONGITUDINAL SPECIMENS AND MANDREL TESTS OF RINGS FROM BARRELS OF SPRINGFIELD RIFLES.

TENSION TESTS OF LONGITUDINAL SPECIMENS FROM BURST BARREL.

Form of specimens.



Mark.	Diameter.	Sectional area.	Tensile strength.		Elongation in ".43.	
			Total.	Per square inch.	Inch.	Per ct.
	Inch.	*Sq. inch.*	*Pounds.*	*Pounds.*		
21	.1488	.0174	1,085	62,360	.15	34.9
22	.1502	.0177	1,080	61,020	.15	34.9

Mark.	Area at fracture.		Contraction of area.	Appearance of fracture.
	Diameter.	Area.		
	Inch.	*Sq. inch.*	*Per cent.*	
21	.091	.0065	62.6	Fine silky.
22	.092	.0066	62.7	Do.

MANDREL TEST OF RINGS.

Rings marked A from burst barrel.
Rings marked B from new barrel.
Mandrel lubricated with lead and tallow and forced into rings in one direction only.
Dimensions of rings, ".45 caliber by ".45 long.
Taper of mandrel, 1 in 20.

Marks.	Exterior diameter.	Maximum resistance.	Diameter of bore at time of rupture.
	Inch.	*Pounds.*	*Inch.*
A_1	.950	9,600	.79
A_2	.962	10,560	.82
A_3	.9725	8,430	.74
B_1	.945	9,850	.81
B_2	.956	10,400	.85
B_3	.966	11,500	.85

SHEET-BRASS,

AND

BRASS, COPPER, AND GERMAN-SILVER WIRE.

MATERIAL FURNISHED BY

MESSRS. HOLMES, BOOTH, AND HAYDENS,

WATERBURY, CONN.

The series comprises tests of rolled sheet-brass, soft-rolled and hard-rolled, up to ten numbers hard; tests of soft and hard drawn copper, brass, and German-silver wire.

The marks on the wire specimens are explanatory of the reductions in the dies.

The average results of the sheet-brass are as follows:

Marks.	Dimensions.	Elastic limit per square inch.	Tensile strength per square inch.	Ratio elastic limit to tensile strength.
	" "	*Pounds.*	*Pounds.*	*Per cent.*
Nos. 1 to 8, soft brass	4.5 × .08	10,960	45,110	24.3
Nos. 1 to 8, soft brass	4.5 × .025	12,970	44,220	29.3
Nos. 1 to 8, 2 Nos. hard	4½ × .025	48,790	65,730	74.2
Nos. 1 to 8, 4 Nos. hard	4½ × .025	68,810	79,310	86.8
Nos. 1 to 8, 10 Nos. hard	4½ × .025	87,320	95,910	91.0

Marks.	Elongation.			Contraction of area.		
	Average.	Maximum.	Minimum.	Average.	Maximum.	Minimum.
	Per ct.	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*
Nos. 1 to 8, soft brass	63.4	74.0	42.5	48.9	52.7	38.1
Nos. 1 to 8, soft brass	45.2	61.3	21.9	41.8	49.1	33.1
Nos. 1 to 8, 2 Nos. hard	21.3	24.4	4.3	25.6	22.8	20.7
Nos. 1 to 8, 4 Nos. hard	6.5	9.1	0.2	19.3	24.1	11.2
Nos. 1 to 8, 10 Nos. hard	1.6	2.3	1.2	.....	.....	.....

The range in tensile strength of the copper wire is seen to be between the limits of 29,470 pounds per square inch for the soft wire and 75,260 pounds per square inch for the hard wire.

Although subject to some fluctuations, the strength of the soft wire gradually increased per unit of area as the size diminished, and the hard-drawn wire is much stronger than the soft.

The maximum effect of drawing, on the strength, seems to have been reached with the copper wire No. 1549, five numbers hard, if we regard the strength of No. 1557, nine numbers hard, exceptional.

The elongation of both the copper and the brass is greatly lowered in the hard wire. The contraction of area is also affected to a less extent comparatively, yet actually a considerable reduction.

The range of tensile strength of the brass wire is from 42,950 to 126,110 pounds per square inch, the limits of the soft and hard wire, respectively.

Here, too, there is a tendency to higher strength in the soft wire as the sizes diminish, which is most pronounced in the higher numbers.

The hard wire not only has a much increased tensile strength over the soft of the same size, but in many instances the total pounds sustained by the hard wire was greater after having been drawn down two numbers than it sustained when soft in the larger sizes.

The copper wire shows similar examples; or, stated in another way, the gain in strength of the hard wire more than compensates for its loss in sectional area when drawn down in size.

The highest strength developed in this series of tests was that shown by the German-silver wire, test No. 1564, 14 S. G., two number hard, which was 140,890 pounds per square inch.

Special observations were made to determine the effect of overstraining on the modulus of elasticity of the sheet-brass.

The effect produced on soft brass sheet No. 1436 is very marked, as shown in the details.

The modulus of elasticity is lowered and variable after overstraining. There was no material change after a rest of 6 days 23 hours; after resting 7 months 10 days, the elongations indicate a recovery, and the modulus is nearly uniform for different increments of load.

The restoration, however, is destroyed by higher loads, which stretch the metal and cause additional sets.

No. 1436.

Marks, No. 7 soft.
Dimensions, 4″.50 × ″.0800=.360 square inch.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
360	1,000	0.	0.	Initial load.
1,800	5,000	.0026	.0001	
3,600	10,000	.0075	.0017	Elastic limit. E=15,517,000.
3,960	11,000	.0096	.....	
4,320	12,000	.0287	.....	
4,680	13,000	.0812	.....	
5,040	14,000	.1270	.....	
5,400	15,000	.1670	.1533	
.....	1,000	.1533	.....	Repeated loads.
.....	5,000	.1560	.....	
.....	10,000	.1603	.....	
.....	1,000	.1533	.....	
5,760	16,000	.2222	.2070	
.....	1,000	.2070	.....	
.....	5,000	.2102	.....	Repeated loads— E=13,700,000. E=11,904,000. E=9,615,000.
.....	10,000	.2143	.....	
.....	15,000	.2200	.....	
.....	10,000	.2166	.....	
.....	5,000	.2123	.....	
.....	1,000	.2076	.....	
.....	5,000	.2105	.....	
.....	10,000	.2147	.....	
.....	15,000	.2199	.....	E=15,625,000. E=11,364,000. E=8,889,000.
.....	10,000	.2168	.....	
.....	15,000	.2199	.....	
.....	10,000	.2167	.....	
.....	5,000	.2123	.....	
.....	1,000	.2078	.....	
360	1,000	.2078	.....	
720	2,000	.2086	.....	
1,080	3,000	.2094	.....	
1,440	4,000	.2100	.....	
1,800	5,000	.2107	.....	
2,160	6,000	.2114	.....	
2,520	7,000	.2121	.....	
2,880	8,000	.2130	.....	
3,240	9,000	.2139	.....	
3,600	10,000	.2147	.....	
3,960	11,000	.2156	.....	
4,320	12,000	.2166	.....	
4,680	13,000	.2176	.....	
5,040	14,000	.2188	.....	
5,400	15,000	.2198	.....	Repeated loads.
.....	14,000	.2192	.....	
.....	13,000	.2186	.....	
.....	12,000	.2180	.....	
.....	11,000	.2172	.....	
.....	10,000	.2165	.....	
.....	9,000	.2158	.....	
.....	8,000	.2150	.....	
.....	7,000	.2142	.....	
.....	6,000	.2132	.....	
.....	5,000	.2124	.....	
.....	4,000	.2114	.....	
.....	3,000	.2103	.....	
.....	2,000	.2091	.....	
.....	1,000	.2077	.....	

Test discontinued in order to allow the metal a period of rest.
Test resumed after a period of rest of 6 days 23 hours.
Measurements taken on the original gauged length.
Micrometer reset.

No. 1436—Continued.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
.....	1,000	0.	.....	Repeated loads.
.....	5,000	.0027	.....	
.....	10,000	.0066	.....	
.....	15,000	.0122	.....	
.....	10,000	.0092	.....	
.....	5,000	.0054	.....	
.....	1,000	.0014	.....	
.....	5,000	.0043	.....	
.....	10,000	.0080	.....	
.....	15,000	.0125	.....	
.....	10,000	.0092	.....	
.....	5,000	.0055	.....	
.....	1,000	.0014	.....	

Test resumed and completed after a further rest of 7 months 10 days.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
.....	1,000	0.	.....	Repeated loads.
.....	5,000	.0031	.....	
.....	10,000	.0064	.....	
.....	15,000	.0108	.....	
.....	10,000	.0073	.....	
.....	5,000	.0038	.....	
.....	1,000	.0005	.....	
.....	1,000	.0005	.....	
.....	5,000	.0038	.....	
.....	10,000	.0071	.....	
.....	15,000	.0108	.....	
.....	10,000	.0072	.....	
.....	5,000	.0038	.....	
.....	1,000	.0005	.....	
.....	5,000	.0038	.....	
.....	10,000	.0071	.....	
.....	15,000	.0108	.....	
.....	16,000	.0126	.....	

Original readings resumed.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
5,760	16,000	.2222	.....	Repeated loads.
6,120	17,000	.2976	.....	
6,480	18,000	.3564	.3384	
.....	1,000	.3384	.....	
.....	5,000	.3418	.....	
.....	10,000	.3461	.....	
.....	15,000	.3516	.....	
.....	10,000	.3489	.....	
.....	5,000	.3434	.....	
.....	1,000	.3389	.....	
.....	5,000	.3421	.....	
.....	10,000	.3462	.....	
.....	15,000	.3515	.....	

No. 1436—Continued.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
6,840	19,000	.1264	.....	
7,200	20,000	.52	.....	
7,920	22,000	.67	.....	
8,640	24,000	.84	.....	
9,360	26,000	1.04	.....	
10,080	28,000	1.24	.....	
10,800	30,000	1.48	.....	
11,520	32,000	1.88 ?	.....	
12,240	34,000	1.95	.....	
12,960	36,000	2.23	.....	
13,680	38,000	2.64	.....	
14,400	40,000	3.08	.....	
15,120	42,000	3.56	.....	
15,840	44,000	4.36	.....	
16,230	45,080	.....	.....	Tensile strength.
0	0	4.80	.....	=48.9 per cent.

Elongation of inch sections, ″.48, ″.47, ″.48, ″.51, ″.50, ″.51, ″.49, ″.49, ″.49, ″.47.

Area at fracture, 3″.67×″.051=.187 square inch. Contraction, 48.1 per cent.

Fractured 9″.6 outside the gauged length.

Fracture began at middle of width of sheet at a small spot of light colored metal, otherwise the fracture was silky oblique.

No. 1437.

Marks, No. 8 soft.
Sectional area, 4″.50 × ″.0796 = .358 square inch.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
358	1,000	0.	0.	Initial load.
716	2,000	.0013	.....	
1,074	3,000	.0020	.....	
1,432	4,000	.0029	.....	
1,790	5,000	.0038	.0004	
2,148	6,000	.0046	.....	
2,506	7,000	.0054	.....	
2,864	8,000	.0063	.....	
3,222	9,000	.0074	.....	
3,580	10,000	.0087	.0021	E = 13,636,000.
3,938	11,000	.0108	.....	Elastic limit.
4,296	12,000	.0166	.....	
4,654	13,000	.0707	.....	
5,012	14,000	.1039	.....	
5,370	15,000	.1460	.....	
5,728	16,000	.2005	.1855	
.....	1,000	.1855		
.....	5,000	.1882		
.....	10,000	.1923		
.....	15,000	.1979	.....	Repeated loads.
.....	10,000	.1946		
.....	5,000	.1902		
.....	1,000	.1858		
6,086	17,000	.26	.....	
6,444	18,000	.37	.....	
6,802	19,000	.41	.....	
7,160	20,000	.48	.....	
7,518	21,000	.54	.....	
7,876	22,000	.60	.....	
8,234	23,000	.71	.....	
8,592	24,000	.80	.....	
8,950	25,000	.88	.....	
9,308	26,000	.98	.....	
9,666	27,000	1.09	.....	
10,024	28,000	1.18	.....	
10,382	29,000	1.29	.....	
10,740	30,000	1.40	.....	
11,098	31,000	1.50	.....	
11,456	32,000	1.60	.....	
11,814	33,000	1.76	.....	
12,172	34,000	1.88	.....	
12,530	35,000	2.01	.....	
12,888	36,000	2.17	.....	
13,246	37,000	2.32	.....	
13,604	38,000	2.47	.....	
13,962	39,000	2.65	.....	
14,320	40,000	2.82	.....	
14,678	41,000	3.06	.....	
15,036	42,000	3.32	.....	
15,394	43,000	3.63	.....	
15,752	44,000	3.92	.....	
16,110	45,000	4.38	.....	

After stretching the metal as above shown the load was released, the sectional area measured, and a new gauged length established of 1 and loads and measurements renewed.

This being done for the purpose of ascertaining the elasticity of metal after so great elongation had taken place.

No. 1437—Continued.

Present sectional area, 3″.78 × ″.0662 = .250 square inch.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
250	1,000	0.	.....	Initial load.
1,250	5,000	.0029	.....	
2,500	10,000	.0061	.....	
3,750	15,000	.0093	.....	
5,000	20,000	.0129	.....	
6,250	25,000	.0166	.....	
7,500	30,000	.0205	.....	
8,750	35,000	.0244	.....	
10,000	40,000	.0285	.....	
.....	35,000	.0254	.....	Repeated loads.
.....	30,000	.0222	.....	
.....	25,000	.0188	.....	
.....	20,000	.0155	.....	
.....	15,000	.0116	.....	
.....	10,000	.0079	.....	
.....	5,000	.0042	.....	
.....	1,000	.0008	.....	
.....	40,000	.0284	.....	
.....	35,000	.0253	.....	
.....	30,000	.0221	.....	
.....	1,000	.0013	.....	

Measurements now taken on original gauged length.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
16,468	46,000	5.02	.....	
16,810	46,960	5.97	.....	Tensile strength.
0	0	5.83	.....	= 58.3 per cent.

No. 1454.

Marks, $\frac{\text{No. 1}}{2\ \text{No. hard}}$

Sectional area, 4″.51 × ″.0263 = .119 square inch.

Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
119	1,000	0.	0.	Initial load.
595	5,000	.0030	.....	
1,190	10,000	.0061	.....	
1,785	15,000	.0092	.....	
2,380	20,000	.0122	.....	E=15,924,000.
2,975	25,000	.0154	.....	
3,570	30,000	.0187	.....	
2,975	25,000	.0155	.....	
2,380	20,000	.0124	.....	
1,785	15,000	.0092	.....	
1,190	10,000	.0061	.....	
595	5,000	.0031	.....	
119	1,000	.....	0.	
4,165	35,000	.0226	.....	
4,760	40,000	.0271	.....	
4,879	41,000	.0282	.....	
4,998	42,000	.0292	.....	
5,117	43,000	.0305	.....	
5,236	44,000	.0319	.....	
5,355	45,000	.0333	.....	
5,474	46,000	.0350	.....	Elastic limit.
5,593	47,000	.0371	.....	
5,712	48,000	.0396	.....	
5,831	49,000	.0423	.....	
5,950	50,000	.0479	.....	
6,069	51,000	.0558	.....	
6,188	52,000	.0769	.....	
6,307	53,000	.1225	.0781	
.....	1,000	.0781	.....	
.....	5,000	.0816	.....	
.....	10,000	.0850	.....	
.....	15,000	.0882	.....	
.....	20,000	.0914	.....	
.....	25,000	.0950	.....	
.....	30,000	.0985	.....	Repeated loads.
.....	25,000	.0953	.....	
.....	20,000	.0923	.....	
.....	15,000	.0890	.....	
.....	10,000	.0858	.....	
.....	5,000	.0824	.....	
.....	1,000	.0786	.....	
7,021	59,000	.....	.....	Tensile strength.

No. 1470.

Marks, $\frac{\text{No. 1}}{\text{4 No. hard}}$

Sectional area, 4″.51 × ″.0258 = .116 square inch.

Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
116	1,000	0.	0.	Initial load.
580	5,000	.0029	.....	
1,160	10,000	.0060	.....	
1,740	15,000	.0091	.....	
2,320	20,000	.0122	.....	
2,900	25,000	.0153	.....	
3,480	30,000	.0185	.....	
4,060	35,000	.0223	.....	
4,640	40,000	.0257	.....	
5,220	45,000	.0297	.....	
5,800	50,000	.0340	.0007	
.....	50,000	.0338	.....	
.....	45,000	.0306	.....	
.....	40,000	.0273	.....	
.....	35,000	.0240	.....	
.....	30,000	.0208	.....	
.....	25,000	.0173	.....	Repeated loads.
.....	20,000	.0140	.....	
.....	15,000	.0107	.....	
.....	10,000	.0072	.....	
.....	5,000	.0040	.....	
.....	1,000	.0010	.....	
6,380	55,000	.0388	.....	
6,496	56,000	.0400	.....	
6,612	57,000	.0410	.....	
6,728	58,000	.0420	.....	
6,844	59,000	.0432	.....	
6,960	60,000	.0447	.....	
7,076	61,000	.0462	.....	
7,192	62,000	.0476	.....	
7,308	63,000	.0488	.....	
7,424	64,000	.0507	.....	
7,540	65,000	.0529	.....	
7,656	66,000	.0548	.....	Elastic limit.
7,772	67,000	.0574	.....	
7,888	68,000	.0600	.....	
8,004	69,000	.0635	.....	
8,120	70,000	.0678	.....	
8,236	71,000	.0731	.....	
8,352	72,000	.0818	.....	
8,468	73,000	.1020	.....	
8,584	74,000	.22	.....	
8,650	74,570	.....	.....	Tensile strength.

No. 1486.

Marks, $\frac{\text{No. 1}}{10\ \text{No. hard}}$

Sectional area, 4″.51 × ″.0258 = .116 square inch.

Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
116	1,000	0.	0.	Initial load.
580	5,000	.0036	.....	
1,160	10,000	.0070	.....	
1,740	15,000	.0103	.....	
2,320	20,000	.0138	.....	
2,900	25,000	.0171	.....	
3,480	30,000	.0205	.0000	
4,060	35,000	.0239	.....	
4,640	40,000	.0275	.....	
5,220	45,000	.0315	.....	
5,800	50,000	.0355	.....	
6,380	55,000	.0397	.....	
6,960	60,000	.0439	.....	
.....	55,000	.0405	.....	E = 14,706,000.
.....	50,000	.0368	.....	
.....	45,000	.0331	.....	E = 13,514,000.
.....	40,000	.0295	.....	
.....	35,000	.0260	.....	
.....	30,000	.0221	.....	
.....	25,000	.0184	.....	Repeated loads.
.....	20,000	.0152	.....	E = 15,625,000.
.....	15,000	.0115	.....	
.....	10,000	.0081	.....	
.....	5,000	.0046	.....	
.....	1,000	.....	.0012	
7,540	65,000	.0485	.....	
8,120	70,000	.0537	.....	
8,700	75,000	.0597	.....	
9,280	80,000	.0670	.0050	
9,396	81,000	.0685	.....	
9,512	82,000	.0698	.....	
9,628	83,000	.0716	.....	
9,744	84,000	.0734	.....	
9,860	85,000	.0755	.....	Elastic limit.
9,976	86,000	.0779	.....	
10,092	87,000	.0804	.....	
10,208	88,000	.0834	.....	
10,324	89,000	.0868	.....	
10,440	90,000	.0914	.0165	
11,120	95,860	.....	.....	Tensile strength.

No. 1563.

Wire, 18 per cent. German silver.
Marks, $\frac{12 \text{ S. G.}}{2 \text{ No. hd.}}$
Diameter, ″.1100.
Sectional area, .0095 square inch.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
100	.....	0.	0.	Initial load.
200	.....	.0062	.....	
300	.....	.0117	.....	
400	.....	.0179	.....	
500	.....	.0240	.....	
600	.....	.0292	.....	
700	73,680	.0360	.....	Elastic limit.
100	.....	.....	.0009	E = 17,991,000.
800	.....	.0434	.....	
900	.....	.0514	.....	
1,000	.....	.0622	.....	
1,100	.....	.0772	.....	
1,200	.....	.1012	.....	
1,225	128,950	.....	.....	Tensile strength.

No. 1564.

Wire, 18 per cent. German silver.
Marks, $\frac{14 \text{ S. G.}}{4 \text{ Nos. hd.}}$
Diameter, ″.0843.
Sectional area, .0056 square inch.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
100	.....	0.	0.	Initial load.
200	.....	.0107	.....	
300	.....	.0209	.....	
400	.....	.0321	.....	
500	.....	.0441	.....	
100	.....	.....	.0023	E = 17,088,000.
600	107,140	.0566	.....	Elastic limit.
650	.....	.0677	.....	
700	.....	.0777	.....	
789	140,890	.....	.....	Tensile strength.

SHEET-BRASS.

[Length between grips, 12″.]

No. of test.	Mark on specimen.	Dimensions.		Sectional area.	Elastic limit.		Ultimate strength.		Elongation in 10 inches.		Area at fracture.	Contraction of area.	Appearance of fracture.	Elongation of 1-inch sections.								
		Width.	Thickness.		Total.	Per square inch.	Total.	Per square inch.	In.	Per cent.												
		Inches.	*Inch.*	*Sq.in.*	*Lbs.*	*Pounds.*	*Lbs.*	*Pounds.*			″ ″ □″	*Perct.*		″	″	″	″	″	″	″	″	″
1430	No. 1 soft	4.50	.0796	.358	4,080	11,400	16,075	44,900	6.58	65.8	3.21×.053=.170	52.5	.....	.51,	.52,	.55,	.56,	.65,	.79,	1.05*,	.73,	.64,	.58
1431	No. 2 soft	4.50	.0790	.356	3,920	11,010	15,960	44,830	6.76	67.6	3.24×.054=.175	50.8	.....	.53,	.54,	.57,	.63,	.66,	.77,	1.03*,	.78,	.66,	.59
1432	No. 3 soft	4.50	.0788	.355	3,810	10,730	15,900	44,780	6.65	66.5	3.24×.052=.168	52.7	.....	.57,	.59,	.60,	.67,	.83,	.97*,	.70,	.64,	.55,	.53
1433	No. 4 soft	4.50	.0800	.360	4,080	11,330	16,220	45,060	7.40	74.0	3.24×.051=.175	51.4	.....	.66,	.70,	.82,	1.09*,	.74,	.69,	.68,	.70,	.68,	.64
1434	No. 5 soft	4.50	.0793	.357	4,190	11,740	15,920	44,590	4.25	42.5	3.74×.059=.221	38.1	.....	.43,	.43,	.43,	.43,	.42,	.43,	.43,	.42,	.42,	.41
1435	No. 6 soft	4.50	.0800	.360	3,780	10,500	16,070	44,640	6.93	69.3	3.43×.055=.189	47.5	.....	.63,	.64,	.70,	.75,	.76,	.83*,	.69,	.67,	.65,	.61
1436	No. 7 soft	4.50	.0800	.360	3,600	10,000	16,230	45,080	4.89	48.9	3.67×.051=.187	48.1	See details.....	.48,	.47,	.48,	.51,	.50,	.51,	.49,	.49,	.49,	.47
1437	No. 8 soft	4.50	.0796	.358	3,938	11,000	16,810	46,960	5.83	58.3	3.31×.055=.182	49.1	....do	.70,	.59,	.58,	.60,	.59,	.59,	.57,	.55,	.53,	.53
1438	No. 1 soft	4.51	.0262	.118	1,420	12,030	4,620	39,150	2.99	29.9	3.97×.020=.079	33.1	.....	.43*,	.29,	.27,	.27,	.28,	.27,	.29,	.28,	.30,	.31
1439	No. 1 soft	4.51	.0260	.117	1,560	13,330	5,430	46,410	5.92	59.2	3.32×.018=.060	48.7	.....	.52,	.57,	.86*,	.77,	.65,	.59,	.54,	.50,	.47,	.45
1440	No. 2 soft	4.51	.0262	.118	1,020	8,640	5,120	43,390	4.09	40.9	3.71×.019=.070	40.7	One edge slack. Fractured at center punch-mark.	.39,	.38,	.37,	.40,	.43,	.44,	.44,	.42,	.42,	.40
1441	No. 2 soft	4.21	.0263	.119	1,325	11,130	4,180	35,130	2.40	24.0	3.97×.020=.079	33.6	Fracture began at one edge. Spot of light silvery metal ″.45 from the edge.	.23,	.24,	.22,	.22,	.22,	.24,	.39*,	.24,	.21,	.19
1442	No. 3 soft	4.51	.0258	.116	1,330	11,470	5,260	45,340	5.44	54.4	3.55×.019=.067	42.2	.....	.47,	.46,	.49,	.50,	.54,	.54,	.60,	.67*,	.59,	.58
1443	No. 3 soft	4.51	.0258	.116	1,310	11,290	5,190	44,740	5.10	51.0	3.69×.019=.070	39.7	Fractured at center punch-mark.	.56,	.53,	.53,	.52,	.53,	.53,	.52,	.48,	.47,	.43
1444	No. 4 soft	4.51	.0262	.118	1,420	12,030	5,395	45,680	5.95	59.5	3.33×.019=.063	46.6	.....	.45,	.47,	.48,	.50,	.57,	.57,	.63,	.76,	.88*,	.64
1445	No. 4 soft	4.51	.0260	.117	1,465	12,520	5,325	45,480	5.70	57.0	3.33×.019=.063	46.1	.....	.47,	.50,	.53,	.60,	.75,	.87*,	.58,	.50,	.46,	.44
1446	No. 5 soft	4.51	.0260	.117	1,460	12,480	5,460	46,670	6.18	61.8	3.32×.018=.060	48.7	.....	.53,	.56,	.59,	.72,	.93*,	.64,	.52,	.52,	.58,	.59
1447	No. 5 soft	4.51	.0262	.118	1,490	12,630	5,470	46,360	5.63	56.3	3.34×.018=.060	49.1	.....	.43,	.44,	.46,	.46,	.48,	.48,	.58,	.66,	.96*,	.68
1448	No. 6 soft	4.51	.0260	.117	1,425	12,180	4,100	35,040	2.40	24.0	3.91×.020=.078	33.3	Parted first at the middle at a spot of light silvery metal. This spot was ″.38 wide and extended each way from the place of fracture a total length of 2½″.	.21,	.21,	.21,	.20,	.21,	.22,	.21,	.22,	.22,	.49*

1449	No. 6 soft.	4.51	.0260	.117	1,410	12,650	5,340	45,640	6.06	60.6	3.43×.018=.062	47.0		.47,	.46,	.48,	.51,	.56,	.61,	.67,	.75,	.90*,	.65
1450	No. 7 soft.	4.51	.0255	.115	1,600	13,910	5,455	47,390	4.97	49.7	3.55×.019=.067	41.7	Fractured at center punch-mark.	.43,	.45,	.45,	.46,	.48,	.50,	.50,	.55,	.56,	.59*
1451	No. 7 soft.	4.51	.0258	.116	1,680	14,480	5,370	46,290	3.77	37.7	3.76×.020=.075	35.3		.39,	.39,	.38,	.37,	.38,	.37,	.39,	.36,	.39,	.35
1452	No. 8 soft.	4.51	.0263	.119	2,210	18,570	5,980	50,250	3.63	36.3	3.70×.017=.063	47.1		.33,	.33,	.33,	.33,	.36,	.34,	.38,	.40,	.40,	.43
1453	No. 8 soft.	4.51	.0262	.118	2,220	18,810	5,290	44,830	2.19	21.9	3.99×.019=.076	35.6	Spot of silvery metal ".05 wide near the middle of sheet at place of rupture.	.23,	.21,	.23,	.21,	.29,	.22,	.21,	.23,	.22,	.21
	2 No. hard:																						
1454	No. 1...	4.51	.0263	.119	5,474	46,000	7,021	59,000	2.28	22.8	3.98×.020=.080	32.8	See details	.34,	.33*,	.27,	.25,	.25,	.23,	.21,	.17,	.12,	.11
1455	No. 1...	4.51	.0259	.117	5,200	44,440	7,620	65,130	2.13	21.3	4.11×.022=.090	23.1		.14,	.14,	.16,	.22,	.27,	.28,	.24,	.26,	.25,	.22
1456	No. 2...	4.51	.0258	.116	5,380	46,380	7,760	66,900	2.43	24.3	4.02×.022=.088	24.1		.23,	.25,	.29,	.37*,	.28,	.25,	.21,	.20,	.16,	.19
1457	No. 2...	4.51	.0258	.116	5,300	45,690	6,930	59,740	2.44	24.4	4.07×.022=.090	22.4		.22,	.23,	.26,	.26,	.26,	.27,	.31*,	.23,	.20,	.20
1458	No. 3...	4.51	.0257	.116	5,560	47,930	7,490	64,570	2.41	24.1	4.03×.021=.085	26.7		.19,	.24,	.24,	.26,	.36*,	.28,	.27,	.23,	.17,	.17
1459	No. 3...	4.51	.0258	.116	5,850	50,430	7,710	66,470	2.27	22.7	4.07×.022=.090	22.4		.24,	.25,	.28,	.26,	.29*,	.21,	.18,	.16,	.20,	.20
1460	No. 4...	4.51	.0259	.117	5,880	50,260	7,830	66,920	2.12	21.2	3.99×.022=.088	24.8		.36*,	.31,	.31,	.26,	.23,	.17,	.16,	.13,	.08,	.11
1461	No. 4...	4.51	.0262	.118	5,940	50,340	8,220	69,660	2.37	23.7	3.96×.021=.083	29.7		.13,	.20,	.26,	.41*,	.35,	.28,	.24,	.20,	.17,	.13
1462	No. 5...	4.51	.0262	.118	5,850	49,580	7,640	64,750	2.21	22.1	4.08×.021=.086	27.1		.17,	.23,	.25,	.24,	.27,	.31*,	.21,	.20,	.19,	.14
1463	No. 5...	4.51	.0262	.118	5,800	49,150	8,410	71,270	2.32	23.2	4.01×.021=.084	28.8		.20,	.18,	.15,	.20,	.22,	.27,	.36*,	.27,	.27,	.20
1464	No. 6...	4.51	.0262	.118	5,500	46,610	7,620	64,580	2.17	21.7	4.06×.022=.089	24.6		.16,	.15,	.17,	.16,	.26,	.23,	.25,	.32*,	.26,	.21
1465	No. 6...	4.51	.0261	.118	5,690	48,220	7,920	67,120	2.23	22.3	4.10×.021=.086	27.1		.22,	.17,	.22,	.24,	.28*,	.24,	.22,	.24,	.19,	.21
1466	No. 7...	4.51	.0258	.116	5,580	48,100	7,330	63,190	2.17	21.7	4.07×.021=.085	26.7		.19,	.20,	.22,	.32,	.26*,	.27,	.18,	.22,	.16,	.15
1467	No. 7...	4.51	.0258	.116	5,990	51,640	7,980	68,790	2.21	22.1	4.10×.021=.086	25.9		.23,	.28,	.30,	.24,	.23,	.26*,	.18,	.15,	.17,	.17
1468	No. 8...	4.51	.0274	.124	6,830	55,240	9,090	73,310	1.93	19.3	4.12×.023=.095	23.4		.12,	.13,	.19,	.23,	.31*,	.22,	.19,	.20,	.18,	.16
1469	No. 8...	4.51	.0269	.121	6,120	50,580	7,300	60,330	.43	4.3	4.36×.022=.096	20.7	Small spot of silvery metal ".60 from edge of sheet.	.01,	.03,	.04,	.02,	.03,	.05,	.10*,	.02,	.02,	.02
	4 No. hard:																						
1470	No. 1...	4.51	.0258	.116	7,656	66,000	8,650	74,570	.91	9.1	4.08×.022=.090	22.4	See details	.02,	.01,	.01,	.01,	.02,	.05,	.07,	.22,	.34*,	.16
1471	No. 1...	4.51	.0258	.116	7,800	67,240	9,150	78,880	.91	9.1	4.07×.022=.090	22.4		.04,	.05,	.12,	.36*,	.26,	.06,	.05,	.02,	.00,	.01
1472	No. 2...	4.51	.0260	.117	7,950	67,950	9,270	79,230	.68	6.8	4.20×.023=.097	17.1	Fractured at center punch-mark.	.14,	.14,	.29*,	.07,	.02,	.01,	.00,	.01,	.00,	.00
1473	No. 2...	4.51	.0256	.115	7,500	65,220	9,080	78,960	.72	7.2	4.17×.022=.092	20.0		.02,	.01,	.01,	.02,	.01,	.09,	.14,	.29*,	.10,	.03
1474	No. 3...	4.51	.0258	.116	7,900	68,100	9,620	82,930	.83	8.3	4.17×.021=.088	24.1		.01,	.06,	.04,	.09,	.30*,	.18,	.06,	.06,	.01,	.02
1475	No. 3...	4.51	.0258	.116	8,150	70,260	9,520	82,070	.68	6.8	4.10×.022=.090	22.4		.01,	.01,	.01,	.02,	.02,	.02,	.01,	.04,	.19,	.35*
1476	No. 4...	4.51	.0252	.114	7,660	67,190	9,070	79,560	.87	8.7	4.12×.022=.091	20.2	Fractured at center punch-mark.	.01,	.01,	.02,	.03,	.02,	.08,	.15,	.19,	.28*,	.08
1477	No. 4...	4.51	.0259	.117	7,950	67,950	9,400	80,340	.51	5.1	4.10×.023=.094	19.7		.00,	.00,	.01,	.01,	.01,	.00,	.02,	.03,	.11,	.32*

Specimens marked 4 No. hard generally fractured by separating first at the middle of the width of the sheet. The opening in the fractured section at the place where fracture began was from ".10 to ".15, the other parts of the fractured ends being brought together at the time.

No. of Test.	Mark on specimen.	Dimensions.		Sectional area.	Elastic limit.		Ultimate strength.		Elongation in 10 inches.		Area at fracture.	Contraction of area.	Appearance of fracture.	Elongation of 1-inch sections.
		Width.	Thickness.		Total.	Per sq. inch.	Total.	Per sq. inch.	Inch.	Per cent.				
		Inches.	*Inch.*	*Sq. in.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*			′ ″	*P.ct.*		″ ″ ″ ″ ″ ″ ″ ″ ″ ″
	4 No. hard:													
1478	No. 5	4.51	.0261	.118	8,020	67,970	9,520	80,680	.86	8.6	4.12×.023=.095	19.5		.02, .02, .05, .09, .17, .33*, .08, .04, .03, .03
1479	No. 5	4.51	.0260	.117	7,960	68,030	9,520	81,370	.64	6.4	4.06×.023=.093	20.5		.01, .01, .01, .00, .02, .02, .00, .15, .30*, .12
1480	No. 6	4.51	.0258	.116	7,980	68,790	9,360	80,690	.78	7.8	4.13×.023=.072	18.1	Fractured at center punch-mark.	.00, .00, .01, .02, .03, .01, .09, .17, .20*, .25*
1481	No. 6	4.51	.0260	.117	8,130	69,490	9,210	78,720	.88	8.8	4.05×.023=.095	20.5		.00, .01, .01, .02, .14, .39*, .18, .08, .04, .01
1482	No. 7	4.51	.0261	.118	7,980	67,630	9,300	78,810	.40	4.0	4.12×.023=.093	19.5		.22*, .09, .05, .02, .00, .00, .00, .00, .01, .01
4483	No. 7	4.51	.0257	.116	.....	.....	7,526	64,830	.02	0.2	4.49×.023=.103	11.2	Irregular fracture. Section of hard, darker metal 1¼″ long at middle of the sheet.	
1484	No. 8	4.51	.0262	.118	9,200	77,970	10,180	86,270	.28	2.8	4.31×.022=.095	19.5		.00, .00, .00, .00, .00, .00, .00, .02, .05, .21*
1485	No. 8	4.51	.0253	.114	8,250	72,370	9,240	81,050	.37	3.7	4.35×.023=.100	12.3		.00, .01, .01, .01, .02, .02, .01, .03, .21*, .05
	10 No. hard:													
1486	No. 1	4.51	.0258	.116	9,860	85,000	11,120	95,860	.13	1.3	.....	.....	See details	The elongation after fracture of these specimens was confined chiefly to the vicinity of the place of rupture.
1487	No. 1	4.51	.0263	.119	10,300	86,550	11,440	96,130	.14	1.4	.....	.....	.....	
1488	No. 2	4.51	.0263	.119	10,100	84,870	11,300	94,960	.17	1.7	.....	.....	.....	
1489	No. 2	4.51	.0264	.119	10,400	87,390	11,250	94,540	.23	2.3	.....	.....	Fractured at center punch-mark.	
1490	No. 3	4.51	.0263	.119	10,500	88,240	11,200	94,120	.12	1.2	.....	.....	.....	
1491	No. 3	4.51	.0259	.117	10,150	86,750	10,980	93,850	.22	2.2	.....	.....	.....	
1492	No. 4	4.51	.0262	.118	10,090	85,510	11,270	95,510	.15	1.5	.....	.....	.....	
1493	No. 4	4.51	.0260	.117	10,200	87,180	11,190	95,640	.20	2.0	.....	.....	.....	

The sheets marked 10 No. hard fractured in oblique direction across the width, making with the center line angles from 58° to 59°. Immediately at the line of fracture the metal was drawn down in thickness to about ″.017 to ″.019. Other lines parallel to the line of fracture were developed; also lines intersecting these, making the same angle with the center line of the sheet. These lines were depressions in the surface where the metal drew down in thickness.

No. of test	Mark on specimen.	Dimensions.		Sectional area	Elastic limit.		Ultimate strength.		Elongation in 10 inches.		Area at fracture.	Contraction of area.	Appearance of fracture.	Elongation of 1-inch sections.
		Width.	Thickness.		Total.	Per square inch.	Total.	Per square inch.	Inch.	Per cent.				
		Inches.	*Inch.*	*Sq. in.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*				*Per cent.*		
	10 No. hard:													
1494	No. 5.....	4.51	.0260	.117	10,300	88,030	11,320	96,760	.16	1.6	.....	.....	.....	
1495	No. 5. ...	4.51	.0262	.118	10,450	88,560	11,480	97,290	.13	1.3	.....	.....	Fractured at center punch-mark.	
1496	No. 6.....	4.51	.0263	.119	10,400	87,390	11,520	96,810	.14	1.4	.....	.....	.....	
1497	No. 6.....	4.51	.0262	.118	10,550	89,410	11,480	97,290	.13	1.3	.....	.....	.....	
1498	No. 7.....	4.51	.0257	.116	10,200	87,930	11,150	96,120	.16	1.6	.....	.....	.....	
1499	No. 7.....	4.51	.0260	.117	10,250	87,610	11,240	96,070	.15	1.5	.....	.....	Fractured at center punch-mark.	
1500	No. 8.....	4.51	.0260	.117	10,400	88,880	11,340	96,920	.13	1.3	.....	.....	.....	
1501	No. 8. ...	4.51	.0261	.118	10,360	87,800	11,420	96,780	.16	1.6	.....	.....	.....	

NOTE.—Parts of some fractures of sheets marked 10 No. hard were at right angles, and parts were parallel to the center line of the sheet. These parts comprised only short lengths along the fracture, the general direction of fracture being oblique as before stated.

COPPER, BRASS, AND GERMAN-SILVER WIRE.

COPPER WIRE.

No. of test.	Mark on specimen.	Diameter.	Sectional area.	Elastic limit.		Ultimate strength.		Elongation in 10 inches.		Area at fracture.	Contraction of area.	Appearance of fracture.	Elongation of 1-inch sections.
				Total.	Per square inch.	Total.	Per square inch.	In.	Per cent.				
		Inch.	*Sq in.*	*Lbs.*	*Pounds.*	*Lbs.*	*Pounds.*			" *Sq. in.*	*Per ct*		" " " " " " " " " "
1502	½ inch soft copper.	.51	.2043	2,200	10,770	6,270	30,690	4.31	43.1	Diam. .30 =.0707	65.4	.....	.42, .70*, .45, .41, .41, .40, .38, .39, .37, .38
1503	000 S. G. hard from ½ inch soft.	.423	.1405	4,200	29,890	5,125	36,480	1.92	19.2	Diam. .25 =.0491	65.0	.....	.42, .15, .15, .17, .20, .22, .17, .15, .16, .13
1504	000 S. G. soft	.427	.1432	.....	.....	4,480	31,280	4.31	43.1	Diam. .24 =.0452	68.4	.....	.34, .36, .49, .74*, .50, .40, .36, .37, .40, .35
1505	00 S. G. soft	.375	.1104	1,100	9,960	3,710	33,610	1.58	15.8	Diam. .21 =.0346	68.7	Hard in some sections	.32, .22, .38, .35, .20, .01, .01, .00, .00, .09
1506	00 S. G. hard from 000 soft.	.375	.1104	4,800	43,480	5.340	48,370	.01	0.1	Diam. .26 =.0531	51.9	Fractured at grip	
1507	1 S. G. soft	.309	.0750	.....	.....	2,210	29,470	2.69	26.9	Diam. .20 =.0314	58.1	.....	.32, .31, .33, .29, .27, .26, .24, .25, .20, .22
1508	1 S. G. hard from 00 soft.	.296	.0688	.....	.....	3,320	48,260	.18	1.8	Diam. .24 =.0452	34.3	Fractured at grip	.02, .02, .08, .04, .03, .02, .00, .00, .02, .00
1509	3 S. G. soft	.2535	.0505	.....	.....	1,550	30,690	3.53	35.3	Diam. .15 =.0177	65.0	.....	.29, .35, .53*, .33, .39, .34, .34, .33, .32, .31
1510	3 S. G. hard from 1 S. G. soft.	.259	.0527	.....	.....	2,320	44,020	.44	4.4	Diam. .17 =.0227	56.9	.....	.01, .00, .04, .20, .03, .06, .05, .02, .02, .01

BRASS WIRE.

1511	0. S. G. soft	.329	.0850	1,100	12,940	3,940	46,350	4.72	47.2	Diam. .18 =.0254	70.1	.....	.48, .47, .48, .48, .48, .47, .46, .47, .47, .46
1512	0. S. G. hard from 00 soft.	.3425	.0919	3,950	42,980	5,330	58,000	.37	3.7	Diam. .19 =.0284	69.1	.....	.10, .07, .05, .04, .02, .03, .02, .00, .01, .03
1513	2 S. G. soft	.265	.0638	550	8,620	2,740	42,950	5.77	57.7	Diam. .13 =.0133	79.2	.....	.47, .49, .57, .84*, .63, .59, .61, .57, .52, .48
1514	2 S. G. hard from 0 soft.	.286	.0642	2,980	46,420	4,160	64,800	1.07	10.7	Diam. .17 =.0227	64.6	.....	.09, .10, .12, .34*, .11, .07, .08, .06, .05, .05
1515	4 S. G. soft	.240	.0452	480	10,620	2,095	46,350	4.70	47.0	Diam. .11 =.0095	79.0	.....	
1516	4 S. G. hard from No. 2 soft.	.2402	.0453	1,800	39,740	3,060	67,550	.18	1.8	Diam. .14 =.0154	66.0	Broke outside 10-inch section.	
1517	6 S. G. soft	.202	.0320	.....	.....	1,480	46,250	4.13	41.3	Diam. .11 =.0095	70.3	.....do.....	
1518	6 S. G hard from No. 4 soft.	.204	.0327	.....	.....	2,310	70,640	.05	0.5	Diam. .14 =.0154	52.9	.....do	
1519	6 S. G. spring	.203	.0324	.....	.....	3,370	104,010	.05	0.5	Diam. .14 =.0154	52.5	.....do	
1520	8 S. G. soft	.165	.0214	.....	.....	1,035	48,360	4.53	45.3	Diam. .08 =.0050	76.6	.....do.....	
1521	8 S. G. hard from 6 S. G. soft.	.1615	.0261	.....	.....	1,470	56,320	.04	0.4	Diam. .10 =.0079	69.7	.....do.....	
	10 S. G. soft..	.140	.0154	.....	.....	730	47,300	4.53	45.3	Diam. .07 =.0038	75.3	....	

*Indicates fractured section.

1523	10 S. G. hard from 8 S. G. soft.	.1315	.0173	.....	.....	995	57,510	.12	1.2	Diam. .08 =.0050	71.1	Broke outside 10-inch section.	
1524	8 N. G. spring.....	.1272	.0127	.....	.....	1,520	119,680	.03	0.3	Diam. .10 =.0079	37.8	.....do.....	
1525	13 S. G. soft	.095	.0071	11)	15,490	334	47,040	3.92	39.2	Diam. .06 =.0028	60.6	.....do.....	
1526	13 S. G. hard from 10 S. G. soft.	.0952	.0071	410	57,750	612	86,200	0	0	Diam. .055=.0024	66.2	.....	
1527	13 S. G. spring	.0952	.0071	.....	.....	885	124,650	.....	.....	Diam. .07 =.0038	46.4	.....	
1528	15 S. G. soft	.0716	.0040	.....	.....	196	49,000	.....	.....	Diam. .035=.0010	75.0	.....	
1529	15 S. G. hard from 13 S. G. soft.	.0715	.0040	.....	.....	360	90,000	.....	.....	Diam. .047=.0017	57.5	.....	
1530	17 S. G. soft.....	.056	.0025	.....	.....	134	53,600	.....	.....	Diam. .031=.0008	68.0	.....	
1531	17 S. G. hard from 15 S. G. soft.	.0562	.0025	.....	.....	212	84,800	.....	.....	Diam. .042=.0014	44.0	.....	
1532	18 S. G. soft.....	.048	.0018	.....	.....	111	61,670	.....	.....	Diam. .028=.0006	66.7	.....	
1533	18 S. G. hard from 15 S. G. soft.	.0485	.0018	.....	.....	227	126,110	.....	.....	Diam. .035=.0010	44.4	.....	
1534	20 S. G. hard from 18 S. G. soft.	.0354	.0010	.....	.....	105	105,000	.....	.....	Diam. .029=.0007	30.0	.....	
1535	Not marked	.051	.0020	.....	.....	252	126,000	.....	.....	Diam. .050=.0020	0.0	.....	

COPPER WIRE.

1536	5 S. G. soft.....	.2157	.0965	.....	.....	1,170	32,050	3.26	32.6	Diam. .12 =.0113	69.0	Broke outside 10-inch section.	Fin along the wire.
1537	5 S. G. hard from 3 S. G. soft.	.2188	.0376	.....	.....	1,690	44,950	.11	1.1	Diam. .15 =.0177	52.9	.....do.....	
1538	7 S. G. soft.....	.1818	.0260	.....	.....	836	32,150	4.49	44.9	Diam .11 =.0095	63.5	.....	
1539	7 S. G. hard from 5 S. G. soft.	.1762	.0243	.....	.....	1,190	48,970	.05	0.5	Diam. .13 =.0133	45.3	Broke outside 10-inch section.	
1540	9 S. G. soft	.151	.0179	.....	.....	582	32,510	4.25	42.5	Diam. .08 =.0050	72.1	.....	
1541	9 S. G. hard from 7 S. G. soft.	.1546	.0188	.....	.....	895	47,610	.29	2.9	Diam. .10 =.0079	58.0	.....	
1542	11 S. G. soft	.1168	.0107	.....	.....	348	32,520	.....	.....	Diam. .074=.0043	59.8	.....	Broke at fin.
1543	11 S. G. hard from 9 S. G. soft.	.1169	.0108	475	43,980	582	53,890	.04	0.4	Diam. .084=.0055	49.1	Broke outside 10-inch section.	Do.
1544	12 S. G. soft.....	.1102	.0095	55	5,790	312	32,840	3.42	34.2	Diam. .055=.0024	74.7	.....	
1545	12 S. G. hard, 3 Nos. hard.	.1105	.0096	.....	.....	574	59,790	.....	.....	Diam. .070=.0038	60.4	.....	
1546	13 S. G. soft.....	.0955	.0071	.....	.....	223	31,410	.....	.....	Diam. .051=.0020	70.4	.....	
1547	13 S. G. hard, 4 Nos	.0954	.0071	.....	.....	358	50,420	.....	.....	Diam. .068=.0036	49.3	.....	
1548	14 S. G. soft	.083	.0054	.....	.....	201	37,220	.....	.....	Diam. .051=.0020	63.0	.....	
1549	14 S. G. hard, 5 Nos	.083	.0054	.....	.....	362	67,040	.....	.....	Diam. .055=.0024	55.6	.....	
1550	15 S. G. soft	.0715	.0040	.....	.....	142	35,500	.....	.....	Diam. .040=.0013	67.5	.....	
1551	15 S. G. hard, 6 Nos	.0715	.0040	.....	.....	262	65,500	.....	.....	Diam. .055=.0024	40.0	.....	
1552	16 S. G. soft	.063	.0031	.....	.....	121	39,030	.....	.....	Diam. .034=.0009	80.6	.....	
1553	16 S. G. hard, 7 Nos	.0632	.0031	.....	.....	207	66,770	.....	.....	Diam. .048=.0018	41.0	.....	
1554	17 S. G. soft	.058	.0026	.....	.....	109	41,920	.....	.....	Diam. .035=.0010	61.5	.....	
1555	17 S. G. hard, 8 Nos	.058	.0026	.....	.....	166	63,850	.....	.....	Diam. .014=.0015	42.3	.....	
1556	18 S. G. soft	.0488	.0019	.....	.....	81	42,630	.....	.....	Diam. .028=.0006	68.4	.....	

COPPER, BRASS, AND GERMAN-SILVER WIRE—Continued.

COPPER WIRE—Continued.

No. of test.	Mark on specimen.	Diameter.	Sectional area.	Elastic limit.		Ultimate strength.		Elongation in 10 inches.		Area at fracture.	Contraction of area.	Appearance of fracture.	Elongation of 1-inch sections.
				Total.	Per square inch.	Total	Per square inch.	In.	Per cent.				
		Inch.	*Sq. in.*	*Lbs.*	*Pounds*	*Lbs.*	*Pounds.*			" *Sq. in.*	*Per ct.*		
1557	18 S. G. hard, 9 Nos	.0487	.0019	.....	.....	143	75, 260	.....	.....	Diam. .0 9=.0012	36. 8	.....	
1558	19 S. G. soft	.0412	.0013	.....	.....	66	50, 770	.....	.....	Diam. .024=.0005	61. 5	.....	
1559	19 S.G. hard, 10 Nos	.0414	.0013	.....	.....	89	68, 460	.....	.....	Diam. .029=.0007	46. 2	.....	
1560	20 S. G. soft	.0347	.0009	.....	.....	41	45, 560	.....	.....	Diam. .020=.0003	66. 7	.....	
1561	20 S.G. 11 Nos. hard	.0347	.0009	.....	.....	61	67, 780	.....	.....	Diam. .027=.0006	33. 3	.....	

WIRE, 18 PER CENT. GERMAN SILVER.

1562	18 per cent. G. S. soft, 10 S. G.	.1304	.0134	.....	.....	1, 014	75, 670	3. 41	34. 1	Diam. .075=.0044	67. 2	.....	
1563	No. 12 S. G, 2 Nos. hard.	.1100	.0095	700	73, 680	1, 225	128, 950	.01	0. 1	Diam. .073=.0042	55. 8	See details	
1564	14 S.G., 4 Nos. hard	.0843	.0056	600	107, 140	789	140, 800	.....	.....	Diam. .061=.0029	48. 2	....do.....	
1565	13 N. G., 1 No. soft	.0715	.0040	.....	.....	244	61, 000	.....	.....	Diam. .055=.0024	40. 0	Broke at fin	
1566	14 N. G., 1 No. hard	.066	.0034	.....	.....	388	114, 120	.....	.....	Diam. .048=.0018	46. 5	.....	
1567	18 S.G., 3 Nos. hard	.0490	.0019	.....	.....	211	111, 050	.....	.....	Diam. .041=.0013	31. 6	.....	

COPPER WIRE.

Sample of covered soft copper wire used for electric light purposes.

No. 1576.

Diameter, ".2037.
Sectional area, .0326 square inch.
Gauged length, 10".

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
100	.....	0.	0.	Initial load.
200	.....	.0022	.....	
300	.....	.0045	.....	
400	.....	.0083	.....	
500	.....	.0150	.....	
600	.....	.0400	.....	
700	.....	.2570	.....	
800	.....	.60	.....	
900	.....	1.00	.....	
950	.....	1.25	.....	
1,000	.....	1.60	.....	
1,050	.....	2.28	.....	
1,080	33,130	2.80	.....	Tensile strength.
0	0	3.98	.....	=39.8 per cent.

Diameter at fracture, ".11. Area, .0095 square inch. Contraction, 70.9 per cent.

Cable of 6 copper wires.

Tensile strength, 1,720 pounds.

Loose bundle of 6 insulated copper wires.

Diameter of wires, ".064 each.
Sectional area of 6 wires, .0193 square inch.
Tensile strength, 835 pounds = 43,260 pounds per square inch.
These wires broke in detail.

ALUMINUM BRONZE AND BRASS

FROM THE

COWLES ELECTRIC SMELTING AND ALUMINUM COMPANY.

AND

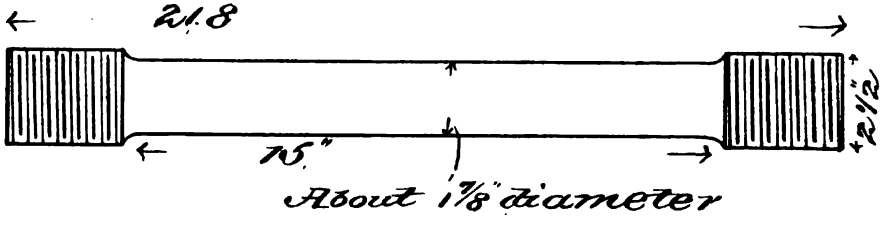
BRONZE FROM THE NEW YORK NAVY YARD.

TESTED FOR

U. S. NAVY DEPARTMENT,

BUREAU OF STEAM ENGINEERING.

Form of specimens



H Ex 45 50 2

No. 1656.

Aluminum bronze—chill casting.

Contains about Al. 7¾, Si. ¾, Cu. 91½.
Marks, 1 C.
Diameter, 1″.875.
Sectional area, 2.7612 square inch.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
2,761	1,000	0.	0.	Initial load.
13,806	5,000	.0027	—.0001	
27,612	10,000	.0057	—.0003	
41,418	15,000	.0092	+.0002	
44,179	16,000	.0102	.....	
46,940	17,000	.0117	.....	
49,701	18,000	.0137	.....	Elastic limit.
52,462	19,000	.0178	.....	
55,224	20,000	.0251	.0126	
57,985	21,000	.0329	.....	
60,746	22,000	.0486	.....	
63,507	23,000	.0676	.....	
66,268	24,000	.0916	.....	
69,030	25,000	.1196	.....	
71,791	26,000	.1512	.....	
		Elongation in 15 inches.	.....	
			.....	
74,552	27,000	.27	.....	
77,313	28,000	.33	.....	
80,074	29,000	.39	.....	
82,836	30,000	.44	.....	
85,597	31,000	.51	.....	
88,358	32,000	.58	.....	
91,119	33,000	.63	.....	
93,880	34,000	.70	.....	
96,642	35,000	.77	.....	
99,403	36,000	.83	.....	
102,164	37,000	.90	.....	
104,925	38,000	.97	.....	
107,686	39,000	1.04	.....	
110,448	40,000	1.11	.....	
113,209	41,000	1.18	.....	
115,970	42,000	1.26	.....	
118,731	43,000	1.34	.....	
121,492	44,000	1.42	.....	
124,254	45,000	1.50	.....	
127,015	46,000	1.59	.....	
129,776	47,000	1.68	.....	
132,537	48,000	1.78	.....	
135,298	49,000	1.88	.....	
138,060	50,000	2.00	.....	
143,582	52,000	2.20	.....	
149,104	54,000	2.37	.....	
154,626	56,000	2.70	.....	Surface cracks.
160,148	58,000	3.00	.....	
165,672	60,000	3.55	.....	
167,809	60,770	.....	.....	Tensile strength.
0	0	3.48	.....	=23.2 per cent.

Fractured 5″.5 from neck.

Diameter at fracture, 1″.56. Area, 1.911 square inches. Contraction, 30.8 per cent.

Elongation of inch sections, ″.21, ″.21, ″.21, ″.24, ″.35*, ″.22, ″.25, ″.23, ″.24, ″.21, ″.21, ″.24, ″.22, ″.23, ″.21.

Hardness: Head, 9.39; stem, 13.85.

Appearance of fracture, lavender color, light yellow, spongy spot ¼ inch diameter at center.

No. 1661.

Aluminum bronze—chill casting.

Composition: Al. 10, Si. 1¼, Cu. 88¾.
Marks, 7 C.
Diameter, 1″.875.
Sectional area, 2.7612 square inches.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
2,761	1,000	0.	0.	Initial load.
13,806	5,000	.0027	.0004	
27,612	10,000	.0056	.0005	
41,418	15,000	.0090	.0008	
55,224	20,000	.0120	.0008	
69,030	25,000	.0167	.0022	
71,791	26,000	.0183	.....	
74,552	27,000	.0193	.....	Elastic limit (not well defined).
77,313	28,000	.0216	.....	
80,074	29,000	.0239	.....	
82,836	30,000	.0264	.0080	
85,597	31,000	.0290	.....	
88,358	32,000	.0321	.....	
91,119	33,000	.0351	.....	
93,880	34,000	.0389	.....	
96,642	35,000	.0430	.0197	
99,403	36,000	.0456	.....	
102,164	37,000	.0499	.....	
104,925	38,000	.0544	.....	
107,686	39,000	.0599	.....	
110,448	40,000	.0661	.0361	
		Elongation in 15 inches.		
115,970	42,000	.13	.....	
121,492	44,000	.14	.....	
127,015	46,000	.17	.....	
132,537	48,000	.19	.....	
138,060	50,000	.22	.....	
143,582	52,000	.26	.....	
149,104	54,000	.30	.....	
154,627	56,000	.34	.....	
160,149	58,000	.40	.....	
165,672	60,000	.47	.....	
171,194	62,000	.56	.....	
176,716	64,000	.61	.....	
182,239	66,000	.....	.....	Tensile strength.
0	0	.58	.....	=3.9 per cent.

Fractured ″.85 from neck.

Diameter at fracture, 1″.80. Area, 2.545 square inches. Contraction, 7.8 per cent.

Elongation of inch sections, ″.02, ″.04, ″.04, ″.03, ″.05, ″.03, ″.03, ″.04, ″.04, ″.03, ″.04, ″.04, ″.04, ″.04, ″.07*.

Hardness: Head, 14.12; stem, 14.26.

Appearance of fracture, lavender color, serrated surface radiati. from small, light yellow spot at the center.

No. 1663.

Aluminum bronze—chill casting.

Composition: Al. 7¾, Si. ¾, Cu. 91½.
Marks, 96 C.
Diameter, 1″.875.
Sectional area, 2.7612 square inches.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
2,761	1,000	0.	0.	Initial load.
13,806	5,000	.0026	0.	
27,612	10,000	.0055	.0001	
41,418	15,000	.0085	.0001	
44,179	16,000	.0092	.....	
46,940	17,000	.0097	.....	
49,701	18,000	.0102	.....	
52,462	19,000	.0109	.....	
55,224	20,000	.0118	.0004	
57,985	21,000	.0128	.....	
60,746	22,000	.0138	.....	
63,507	23,000	.0151	.....	
66,268	24,000	.0168	.....	Elastic limit.
69,030	25,000	.0194	.0040	
71,791	26,000	.0227	.....	
74,552	27,000	.0269	.....	
77,313	28,000	.0320	.....	
80,074	29,000	.0390	.....	
82,836	30,000	.0462	.....	
85,597	31,000	.0548	.....	
88,358	32,000	.0630	.....	
91,119	33,000	.0717	.....	
93,880	34,000	.0817	.....	
96,642	35,000	.0922	.....	
99,403	36,000	.1048	.....	
102,164	37,000	.1173	.....	
		Elongation in 15 inches.		
104,925	38,000	.18	.....	
107,686	39,000	.21	.....	
110,448	40,000	.23	.....	
113,209	41,000	.26	.....	
115,970	42,000	.28	.....	
118,731	43,000	.32	.....	
121,492	44,000	.34	.....	
124,254	45,000	.38	.....	
127,015	46,000	.41	.....	
129,776	47,000	.45	.....	
132,537	48,000	.49	.....	
135,298	49,000	.53	.....	
138,060	50,000	.57	.....	
143,582	52,000	.69	.....	
149,104	54,000	.80	.....	
154,627	56,000	.94	.....	
160,149	58,000	1.09	.....	
165,672	60,000	1.28	.....	
171,194	62,000	1.48	.....	
176,717	64,000	1.73	.....	
182,239	66,000	2.02	.....	
186,800	67,650	.....	.....	Tensile strength.
0	0	1.96	.....	=18.1 per cent.

Fractured 4″ from neck.

Diameter at fracture, 1″.66. Area, 2.164 square inches. Contraction, 21.6 per cent.

Elongation of inch sections, ″.10, ″.12, ″.14, ″.22*, ″.15, ″.14, ″.14, ″.12, ″.13, ″.13, ″.13, ″.11, ″.14, ″.12, ″.07.

Hardness: Head, 11.18; stem, 13.59.

Appearance of fracture, lavender color; yellow, spongy spot ″.2 diameter at the center.

No. 1664.

Aluminum bronze—chill casting.

Composition, Al. 9, Si. 1, Cu. 90.
Marks, 10 C.
Diameter, 1″.875.
Sectional area, 2.7612 square inches.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
2,761	1,000	0.	0.	Initial load.
13,806	5,000	.0026	.0005	
27,612	10,000	.0055	.0005	
41,418	15,000	.0088	.0010	
55,224	20,000	.0120	.0010	
69,030	25,000	.0149	.0010	
71,791	26,000	.0158	.....	
74,552	27,000	.0164	.....	
77,313	28,000	.0170	.....	
80,074	29,000	.0180	.....	
82,836	30,000	.0190	.0020	
85,597	31,000	.0203	.....	
88,358	32,000	.0213	.....	
91,119	33,000	.0223	.....	Elastic limit.
93,880	34,000	.0237	.....	
96,642	35,000	.0253	.0041	
99,403	36,000	.0272	.....	
102,164	37,000	.0288	.....	
104,925	38,000	.0307	.....	
107,686	39,000	.0326	.....	
110,448	40,000	.0352	.0083	
113,209	41,000	.0370	.....	
115,970	42,000	.0392	.....	
118,731	43,000	.0418	.....	
121,492	44,000	.0445	.....	
124,254	45,000	.0495	.....	
127,015	46,000	.0510	.....	
129,776	47,000	.0533	.....	
132,537	48,000	.0565	.....	
135,298	49,000	.0602	.....	
138,060	50,000	.0635	.....	
		Elongation in 15 inches.		
143,582	52,000	.10	.....	
149,104	54,000	.12	.....	
154,627	56,000	.14	.....	
160,149	58,000	.16	.....	
165,672	60,000	.18	.....	
171,194	62,000	.20	.....	
176,717	64,000	.22	.....	
182,239	66,000	.23	.....	
187,761	68,000	.27	.....	
193,285	70,000	.31	.....	
198,807	72,000	.36	.....	
201,100	72,830	.....	.....	Tensile strength.
0	0	.23	.....	=1.5 per cent.

Fractured 5″.75 from neck.

Diameter at fracture, 1″.82. Area, 2.602 square inches. Contraction, 5.8 per cent.

Elongation of inch sections, ″.01, ″.01, ″.01, ″.01, ″.02, ″.06*, ″.0 ″.03, ″.01, ″.00, ″.00, ″.02, ″.01, ″.01, ″.01, ″.01, ″.02.

Appearance of fracture, lavender color, serrated surface radiatin from small spongy spot of yellow metal at the center.

No. 1662.

Aluminum brass—chill casting.

Composition: Al. 3⅓, Si. ⅓, Cu. 63, Zn. 33⅓.
Marks, 11 C.
Diameter, 1″.875.
Sectional area, 2.7612 square inches.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
2,761	1,000	0.	0.	Initial load.
13,806	5,000	.0029	0.	
27,612	10,000	.0064	0.	
41,418	15,000	.0100	0.	
55,224	20,000	.0136	0.	
69,030	25,000	.0174	0.	
82,836	30,000	.0210	0.	
96,642	35,000	.0248	0.	
99,403	36,000	.0255	.....	
102,164	37,000	.0261	.....	
104,925	38,000	.0270	.....	
107,686	39,000	.0277	.....	
110,448	40,000	.0285	0.	
113,209	41,000	.0292	.....	
115,970	42,000	.0300	.....	
118,731	43,000	.0310	.....	
121,492	44,000	.0320	.....	
124,254	45,000	.0327	.0005	
127,015	46,000	.0335	.....	
129,776	47,000	.0344	.....	
132,537	48,000	.0353	.....	
135,298	49,000	.0365	.....	
138,060	50,000	.0375	.0012	
165,672	60,000	.....	.....	No set observed with dividers. Elastic limit between 60 000 and 73,000 pounds per square inch.
200,000	72,430	.....	.04	
222,500	80,580	.....	.25	
227,000	82,210	.....	.....	Tensile strength.
0	0	.35	.....	=2.3 per cent. in 15 inches.

Fractured 5″.75 from neck.

Diameter at fracture, 1″.78. Area, 2.488 square inches. Contraction, 9.9 per cent.

Elongation of inch sections, ″.01, ″.01, ″.02, ″.03, ″.01, ″.09*, ″.03, ″.02, ″.03, ″.02, ″.01, ″.03, ″.01, ″.02, ″.01.

Hardness: Head, 14.69; stem, 10.60.

Flaky in vicinity of cut, thereby vitiating the results of the hardness determination.

Appearance of fracture lavender color, spot of yellow metal″.2 diameter at the center.

No. 1665.

Aluminum bronze—chill casting.

Composition: Al. 7½, Si. ½, Cu. 92.
Marks, 13 C.
Diameter, 1″.875.
Sectional area, 2.7612 square inches.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
2,761	1,000	0.	0.	Initial load.
13,806	5,000	.0021	.0000	
27,612	10,000	.0060	.0000	
41,418	15,000	.0099	.0001	
44,179	16,000	.0103	.....	
46,940	17,000	.0113	.....	
49,701	18,000	.0126	.....	
52,462	19,000	.0137	.....	Elastic limit.
55,224	20,000	.0160	.0029	
57,985	21,000	.0203	.....	
60,746	22,000	.0262	.....	
63,507	23,000	.0352	.....	
66,268	24,000	.0475	.....	
69,030	25,000	.0601	.....	
71,791	26,000	.0800	.....	
74,552	27,000	.0970	.....	
77,313	28,000	.1150	.....	
80,074	29,000	.1380	.....	
82,836	30,000	.1565	.....	
		Elongation in 15 inches.		
85,597	31,000	.27	.....	
88,358	32,000	.31	.....	
91,119	33,000	.34	.....	
93,880	34,000	.40	.....	
96,642	35,000	.43	.....	
99,403	36,000	.48	.....	
102,164	37,000	.52	.....	
104,925	38,000	.57	.....	
107,686	39,000	.61	.....	
110,448	40,000	.67	.....	
113,209	41,000	.73	.....	
115,970	42,000	.78	.....	
118,731	43,000	.83	.....	
121,492	44,000	.91	.....	
124,254	45,000	.97	.....	
127,015	46,000	1.03	.....	
129,776	47,000	1.10	.....	
132,537	48,000	1.19	.....	
135,298	49,000	1.27	.....	
138,060	50,000	1.37	.....	
143,582	52,000	1.54	.....	
149,104	54,000	1.77	.....	
154,627	56,000	2.03	.....	
160,149	58,000	2.37	.....	
163,200	59,100	.....	.....	Tensile strength.
0	0	2.27	.....	= 15.1 per cent.

Fractured 2″.85 from neck.

Diameter at fracture, 1″.64. Area, 2.112 square inches. Contractio 23.5 per cent.

Elongation of inch sections, ″.13, ″.17, ″.28*, ″.16, ″.16, ″.15, ″.1 ″.14, ″.14, ″.13, ″.14, ″.15, ″.12, ″.13, ″13.

Appearance of fracture lavender color, radiant surface, spon spot of yellow metal near the center.

No. 1671.

Aluminum bronze—dry-sand casting—stem of bar as cast.

Composition: Al. 7¾, Si. ¾, Cu. 91½.
Marks, 9 D.
Diameter, 1″.90.
Sectional area, 2.84 square inches.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
2, 840	1, 000	0.	0.	Initial load.
14, 200	5, 000	.0024	0.	
28, 400	10, 000	.0054	0.	
42, 600	15, 000	.0083	.0002	
45, 440	16, 000	.0093	.....	
48, 280	17, 000	.0100	.....	
51, 120	18, 000	.0107	.....	
53, 960	19, 000	.0116	.....	Elastic limit.
56, 800	20, 000	.0129	.0013	
59, 640	21, 000	.0146	.....	
62, 480	22, 000	.0169	.....	
65, 320	23, 000	.0193	.....	
68, 160	24, 000	.0235	.....	
71, 000	25, 000	.0293	.0123	
73, 840	26, 000	.0341	.....	
76, 680	27, 000	.0416	.....	
79, 520	28, 000	.0493	.....	
82, 360	29, 000	.0585	.....	
85, 200	30, 000	.0685	.0441	
.....	1, 000	.0441		
.....	5, 000	.0461		
.....	10, 000	.0495		
.....	15, 000	.0526		
.....	20, 000	.0565		
.....	25, 000	.0607	.....	Repeated loads.
.....	20, 000	.0580		
.....	15, 000	.0550		
.....	10, 000	.0517		
.....	5, 000	.0478		
.....	1, 000	.0435		
88, 040	31, 000	.0740	.....	
90, 880	32, 000	.0870	.....	
93, 720	33, 000	.1005	.....	
96, 560	34, 000	.1130	.....	
		Elongation in 15 inches.		
99, 400	35, 000	.21	.....	
102, 240	36, 000	.23	.....	
105, 080	37, 000	.26	.....	
107, 920	38, 000	.28	.....	
110, 760	39, 000	.32	.....	
113, 600	40, 000	.35	.....	
119, 280	42, 000	.41	.....	
124, 960	44, 000	.49	.....	
130, 640	46, 000	.58	.....	
136, 320	48, 000	.68	.....	
142, 000	50, 000	.80	.....	
147, 680	52, 000	.93	.....	
150, 450	52, 980	.....	.....	Tensile strength.
0	0	.93	.....	=6.2 per cent.

Fractured 1″.75 from neck.

Diameter at fracture, 1″.75. Area, 2.41 square inches. Contraction, 15.1 per cent.

Elongation of inch sections, ″.07, ″.16,* ″.06, ″.07, ″.04, ″.06, ″.05, ″.06, ″.05, ″.05, ″.05, ″.06, ″.04, ″.06, ″.05.

Appearance of fracture, lavender color at the circumference; central metal ″.9 diameter, light yellowish color, spongy.

No. 1670.

Aluminum bronze—dry-sand casting—stem of bar as cast.

Composition: Al. 9, Si. 1, Cu. 90.
Marks, 10 D.
Diameter, 1″.89.
Sectional area, 2.81 square inches.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
2,810	1,000	0.	0.	Initial load.
14,050	5,000	.0023	0.	
28,100	10,000	.0054	0.	
42,150	15,000	.0083	0.	
56,200	20,000	.0115	0.	
59,010	21,000	.0121	.....	
61,820	22,000	.0126	.....	
64,630	23,000	.0135	.....	
67,440	24,000	.0144	.....	
70,250	25,000	.0150	.0003	
73,060	26,000	.0160	.....	
75,870	27,000	.0168	.....	
78,680	28,000	.0179	.....	
81,490	29,000	.0192	.....	
84,300	30,000	.0207	.0013	
87,110	31,000	.0218	.....	
89,920	32,000	.0233	.....	
92,730	33,000	.0248	.....	Elastic limit (not well defined).
95,540	34,000	.0265	.....	
98,350	35,000	.0284	.0058	
101,160	36,000	.0302	.....	
103,970	37,000	.0329	.....	
106,780	38,000	.0343	.....	
109,590	39,000	.0366	.....	
112,400	40,000	.0390	.0113	
115,210	41,000	.0408	.....	
118,020	42,000	.0436	.....	
120,830	43,000	.0463	.....	
123,640	44,000	.0492	.....	
126,450	45,000	.0520	.0187	
129,260	46,000	.0538	.....	
132,070	47,000	.0568	.....	
134,880	48,000	.0602	.....	
137,690	49,000	.0643	.....	
140,500	50,000	.0682	.0281	
143,310	51,000	.0705	.....	
146,120	52,000	.0740	.....	
148,930	53,000	.0787	.....	
151,740	54,000	.0838	.....	
154,550	55,000	.0890	.0418	
		Elongation in 15 inches.		
157,360	56,000	.14	.....	
162,980	58,000	.18	.....	
168,600	60,000	.20	.....	
174,220	62,000	.22	.....	
179,840	64,000	.25	.....	
185,460	66,000	.28	.....	
191,080	68,000	.32	.....	
196,500	69,930	.....	.....	Tensile strength.
0	0	.20	.....	= 1.3 per cent.

Fractured at neck.

Diameter at fracture, 1″.86. Area, 2.72 square inches. Contraction 3.2 per cent.

Elongation of inch sections, ″.03*, ″.02, ″.02, ″.02, ″.01, ″.01, ″.01 ″.01, ″.01, ″.02, ″.01, ″.01, ″.00, ″.01, ″.01.

Hardness: Head, 17.08; stem, 16.07.

Flaky at cut. Appearance of fracture lavender-colored metal, radiating from a point in the circumference. Small spot of yellowish magenta colored metal near the center.

No. 1669.

Aluminum brass—dry-sand casting—stem of bar as cast.

Composition: Al. 3¼, Si. ⅛, Cu. 63, Zn. 33⅛.
Marks, 11 D.
Diameter, 1″.90.
Sectional area, 2.84 square inches.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.	
Total.	Per square inch.	Elongation.	Set.		
Pounds.	*Pounds.*	*Inch.*	*Inch.*		
2,840	1,000	0.	0.		
14,200	5,000	.0032	0.		
28,400	10,000	.0067	.0002		
42,600	15,000	.0106	.0002		
56,800	20,000	.0142	.0002		
71,000	25,000	.0178	.0002		
85,200	30,000	.0214	.0003		
99,400	35,000	.0252	.0003		
113,600	40,000	.0289	.0006		
127,800	45,000	.0328	.0009		
130,640	46,000	.0337	.....		
133,480	47,000	.0349	.....		
136,320	48,000	.0357	.....		
139,160	49,000	.0367	.....		
142,000	50,000	.0377	.0019		
144,840	51,000	.0387	.....		
147,680	52,000	.0399	.....		
150,520	53,000	.0410	.....		
153,360	54,000	.0419	.....		
156,200	55,000	.0428	.0030	Elastic limit.	
159,040	56,000	.0444	.....		
161,880	57,000	.0465	.....	Elongation in 15 inches.	
164,720	58,000	.0482	.....		
167,560	59,000	.0500	.....		
170,400	60,000	.0522	.0087	*Inch.*	
173,240	61,000	.0536	.....	.09	
176,080	62,000	.0562	.....	.09	
178,920	63,000	.0580	.....	.10	
181,760	64,000	.0617	.....	.11	
184,600	65,000	.0659	.....	.11	
187,440	66,000	.0696	.....	.12	
190,280	67,000	.0734	.....	.12	
193,120	68,000	.0786	.....	.13	
195,960	69,000	.0854	.....	.15	
198,800	70,000	.0926	.....	.16	
199,800	70,350	.....	.....	.....	Tensile strength.
0	0	.06	.....	.....	= 0.4 per cent. in 15 inches.

Fractured at neck.

Diameter at fracture, 1″.86. Area, 2.72 square inches. Contraction, 4.2 per cent.

Elongation of inch sections, ″.02*, ″.00, ″.01, ″.00, ″.00, ″.00, ″.00, ″.01, ″.00, ″.01, ″.00, ″.00, ″.00, ″.00, ″01.

Appearance of fracture, intermingling of yellow and lavender-colored spots.

No. 1668.

Aluminum bronze—dry-sand casting—stem of bar as cast.

Composition: Al. 7½, Si. ½, Cu. 92.
Marks, 13 D.
Diameter, 1″.93.
Sectional area, 2.93 square inches.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
2,930	1,000	0.	0.	Initial load.
14,650	5,000	.0030	0.	
17,580	6,000	.0037	.....	
20,510	7,000	.0042	.....	
23,440	8,000	.0050	.....	
26,370	9,000	.0055	.....	
29,300	10,000	.0062	.0002	
32,230	11,000	.0066	.....	
35,160	12,000	.0074	.....	
38,090	13,000	.0083	.....	
41,020	14,000	.0091	.....	
43,950	15,000	.0100	.0007	
46,880	16,000	.0112	.....	
49,810	17,000	.0125	.....	Elastic limit.
52,740	18,000	.0142	.....	
55,670	19,000	.0175	.....	
58,600	20,000	.0226	.....	
61,530	21,000	.0300	.....	
64,460	22,000	.0401	.....	
67,390	23,000	.0505	.....	
70,320	24,000	.0652	.....	
73,250	25,000	.0823	.....	
76,180	26,000	.1037	.....	
79,110	27,000	.1230	.....	
82,040	28,000	.1450	.....	
		Elongation in 15 inches.		
84,970	29,000	.26	.....	
87,900	30,000	.30	.....	
90,830	31,000	.32	.....	
93,760	32,000	.37	.....	
96,690	33,000	.40	.....	
99,620	34,000	.44	.....	
102,550	35,000	.49	.....	
105,480	36,000	.54	.....	
108,410	37,000	.59	.....	
111,340	38,000	.64	.....	
114,270	39,000	.71	.....	
117,200	40,000	.76	.....	
120,130	41,000	.81	.....	
123,060	42,000	.88	.....	
125,990	43,000	.95	.....	
128,920	44,000	1.01	.....	
131,850	45,000	1.10	.....	
134,780	46,000	1.19	.....	
136,400	46,550	.....	.....	Tensile strength.
0	0	1.17	.....	= 7.8 per cent.

Fractured 6″.80 from neck.

Diameter at fracture, 1″.73. Area, 2.35 square inches. Contractio 19.7 per cent.

Elongation of inch sections, ″.07, ″.06, ″.09, ″.06, ″.07, ″.11, ″.15 .08, ″.08, ″.07, ″.06, ″.08, ″.06, ″.06, ″.07.

Appearance of fracture, lavender color at circumference; centr metal, light yellow color.

No. 1657.

Composition from New York Navy Yard—cast in green sand.

Composition: Cu. 88, Zn. 2, Sn. 10.
Mark, 1.
Diameter, 1″.875.
Sectional area, 2.7612 square inches.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
2,761	1,000	0.	0.	Initial load.
13,806	5,000	.0045	.....	
16,567	6,000	.0055	.....	
19,328	7,000	.0065	.....	
22,089	8,000	.0076	.....	
24,850	9,000	.0090	.....	
27,612	10,000	.0108	.0012	Elastic limit.
30,373	11,000	.0133	.....	
33,134	12,000	.0173	.....	
35,895	13,000	.0267	.....	
38,656	14,000	.0443	.....	
41,418	15,000	.0980	.....	
44,179	16,000	.1194	.....	
46,940	17,000	.2085	.....	
49,701	18,000	.....	.....	Tensile strength.
0	0	.38	.....	=2.5 per cent. in 15 inches.

Fractured ″.40 from neck.

Diameter at fracture, 1″.83. Area, 2.630 square inches. Contraction, 4.8 per cent.

Elongation of inch sections, ″.09*, ″.05, ″.02, ″.02, ″.04, ″.02, ″.03, ″.02, ″.02, ″.01, ″.01, ″.00, ″.02, ″.02, ″.01.

Hardness: Head, 3.33; stem, 3.33.

Appearance of fracture, small, vesicular surfaces, varying in color from copper to light silvery.

No. 1659.

Navy Yard bronze—cast in green sand.

Composition same as No. 1657.
Mark, 2.
Diameter, 1″.875.
Sectional area, 2.7612 square inches.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
2,761	1,000	0.	0.	Initial load.
13,806	5,000	.0042	.0001	
16,567	6,000	.0051	.....	
19,324	7,000	.0060	.....	
22,089	8,000	.0071	.....	
24,850	9,000	.0081	.....	
27,612	10,000	.0091	.0005	
30,373	11,000	.0107	.....	Elastic limit.
33,134	12,000	.0128	.....	
35,895	13,000	.0159	.....	
38,656	14,000	.0215	.....	
41,418	15,000	.0376	.....	
44,179	16,000	.0590	.....	
46,940	17,000	.0962	.....	
49,701	18,000	.1550	.....	
		Elongation in 15 inches.		
52,462	19,000	.34	.....	
55,224	20,000	.44	.....	
57,985	21,000	.60	.....	
60,746	22,000	.73	.....	
63,507	23,000	.92	.....	
66,268	24,000	1.13	.....	
67,900	24,590	.....	.....	Tensile strength.
0	0	1.23	.....	= 8.2 per cent.

Fractured ″.35 from neck.

Diameter at fracture, 1″.81. Area, 2.573 square inches. Contraction, 6.8 per cent.

Elongation of inch sections, ″.15*, ″.08, ″.09, ″.08, ″.07, ″.09, ″.07, ″.08, ″.07, ″.07, ″.08, ″.08, ″.09, ″.06, ″.07.

Appearance of fracture, yellowish lavender color, with darker shade of metal at one side.

No. 1666.

Navy-yard bronze, cast in green sand.

Same composition as No. 1657.
Marks, 3.
Diameter, 1″.875.
Sectional area, 2.7612 square inches.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
2,761	1,000	0.	0.	Initial load.
13,806	5,000	.0034	0.	
16,567	6,000	.0044	0.	
19,328	7,000	.0054	.....	
22,089	8,000	.0062	.....	
24,850	9,000	.0074	.....	
27,612	10,000	.0084	.0003	
30,373	11,000	.0097	.....	Elastic limit.
33,134	12,000	.0120	.....	
35,895	13,000	.0144	.....	
38,656	14,000	.0209	.....	
41,418	15,000	.0285	.....	
44,179	16,000	.0545	.....	
46,940	17,000	.0894	.....	
		Elongation in 15 inches.		
52,462	19,000	.28	.....	
55,224	20,000	.41	.....	
57,985	21,000	.56	.....	
60,746	22,000	.74	.....	
62,900	22,780	.....	.....	Tensile strength.
0	0	.88	.....	=5.9 per cent.

Fractured 1″.90 from neck.

Diameter at fracture, 1″.77. Area, 2.461 square inches. Contraction, 10.9 per cent.

Elongation of inch sections, ″.04, ″.12*, ″.07, ″.05, ″.05, ″.06, ″.05, ″.06, ″.04, ″.06, ″.09, ″.06, ″.05, ″.04, ″.04.

Appearance of fracture, coarse, irregular facets, lavender color at circumference, central part varies in color from light yellow to deep golden.

No. 1667.

Navy-yard bronze, cast in green sand. Stem of bar as cast.

Same composition as No. 1657.
Marks, 4.
Diameter, 1″.88.
Sectional area, 2.776 square inches.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
2,776	1,000	0.	0.	Initial load.
13,880	5,000	.0034	.0004	
16,656	6,000	.0044	.....	
19,432	7,000	.0053	.....	
22,208	8,000	.0063	.....	
24,984	9,000	.0069	.....	
27,760	10,000	.0077	.0005	
30,536	11,000	.0088	.....	
33,312	12,000	.0100	.....	
36,088	13,000	.0114	.....	Elastic limit.
38,864	14,000	.0135	.....	
41,640	15,000	.0173	.....	
44,416	16,000	.0258	.....	
47,192	17,000	.0468	.....	
49,968	18,000	.0763	.....	
		Elongation in 15 inches.		
52,744	19,000	.17	.....	
55,520	20,000	.26	.....	
58,296	21,000	.36	.....	
61,072	22,000	.46	.....	
63,848	23,000	.....	.....	Tensile strength.
0	0	.60	.....	= 4.0 per cent.

Fractured ″.80 from neck.

Diameter at fracture, 1″.78. Area, 2.488 square inches. Contraction, 10 4 per cent.

Elongation of inch sections, ″.12*, ″.05, ″.03, ″.04, ″.04, ″.04, ″.02, ″.04, ″.03, ″.04, ″.03, ″.04, ″.04, ″.03, ″01.

Appearance, dark lavender color, interspersed with lighter colored silvery and yellowish metal.

No. 1658.

Navy-yard bronze, cast in green sand. Stem of bar as cast.

Composition same as No. 1657.
Marks, 5.
Diameter, 1″.88.
Sectional area, 2.776 square inches.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
2,776	1,000	0.	0.	Initial load.
13,880	5,000	.0039	−.0001	
16,656	6,000	.0046	.....	
19,432	7,000	.0053	.....	
22,208	8,000	.0063	.....	
24,984	9,000	.0070	.....	
27,760	10,000	.0079	0.	
30,536	11,000	.0090	.....	
33,312	12,000	.0097	.....	
36,088	13,000	.0112	.....	Elastic limit.
38,864	14,000	.0136	.....	
41,640	15,000	.0190	.0071	
44,416	16,000	.0279	.....	
47,192	17,000	.0446	.....	
49,968	18,000	.0784	.....	
52,744	19,000	.1239	.....	
		Elongation in 15 inches.		
55,520	20,000	.24	.....	
57,100	20,570	.....	.....	Tensile strength.
0	0	.35	.....	=2.3 per cent.

Fractured ″.70 from neck.

Diameter at fracture, 1″.82. Area, 2.601 square inches. Contraction, 6.3 per cent.

Elongation of inch sections, ″.11*, ′.02, ″.03, ″.02, ″.02, ″.02, ″.01, ″.03, ″.01, ″.01, ″.02, ″.02, ″.01, ″.01, ″.01.

Appearance of fracture, dark lavender color, interspersed with lighter colored silvery and yellowish metal.

No. 1660.

Navy-yard bronze, cast in green sand. Stem of bar as cast.

Composition same as No. 1657.
Marks, 6.
Diameter, 1″.88.
Sectional area, 2.776 square inches.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
2,776	1,000	0.	0.	Initial load.
13,880	5,000	.0035	.0008	
16,656	6,000	.0038	.....	
19,432	7,000	.0051	.....	
22,208	8,000	.0061	.....	
24,984	9,000	.0070	.....	
27,760	10,000	.0079	.0006	
30,536	11,000	.0090	.....	
33,312	12,000	.0098	.....	
36,088	13,000	.0106	.....	Elastic limit.
38,864	14,000	.0127	.....	
41,640	15,000	.0162	.....	
44,416	16,000	.0225	.....	
47,192	17,000	.0372	.....	
49,968	18,000	.0630	.....	
52,744	19,000	.0990	.....	
55,520	20,000	.1290	.....	
		Elongation in 15 inches.		
58,296	21,000	.25	.....	
61,072	22,000	.37	.....	
63,848	23,000	.47	.....	
65,960	23,760	.....	.....	Tensile strength.
0	0	.56	.....	=2.7 per cent.

Fractured ″.55 from neck.
Diameter at fracture, 1″.81. Area, 2.573 square inches.
Elongation of inch sections, ″.11*, ″.02, ″.04, ″.04, ″.02, ″.04, ″.05, ″.02, ″.04, ″.03, ″.03, ″.03, ″.04, ″.03, ″.02.
Hardness: Head, 3.67; stem, 6.56.
Appearance of fracture, dark lavender color.

ALUMINUM BRONZE

TO BE USED FOR

GUN VENTS.

Grade of metal, A No. 8.

709

No. 3645.

Mark, 1.
Diameter, ″.505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000250	.000250	0.	.....	
2,000	10,000	.000550	.000300	0.	.....	
3,000	15,000	.000750	.000200	0.	.....	
4,000	20,000	.001100	.000350	0.	.....	
5,000	25,000	.001400	.000300	0.	.....	
6,000	30,000	.001750	.000350	0.	.....	
7,000	35,000	.002000	.000250	0.	.....	
8,000	40,000	.002300	.000300	0.	.....	
9,000	45,000	.002700	.000400	0.	.....	
10,000	50,000	.003050	.000350	0.	.....	Elastic limit.
10,200	51,000	.003250	.000200	.....	.....	
10,400	52,000	.003450	.000200	.....	.....	
10,600	53,000	.003600	.000150	.....	.....	
10,800	54,000	.003850	.000250	.....	.....	
11,000	55,000	.004300	.000450	.000500	.000500	
11,200	56,000	.004800	.000200	.....	.....	
11,400	57,000	.005200	.000700	.....	.....	
11,600	58,000	.005850	.000650	.....	.....	
11,800	59,000	.006300	.000450	.....	.....	
12,000	60,000	.008000	.001700	.....	.....	
12,400	62,000	.010400	.002400	.....	.....	
12,800	64,000	.013250	.002850	.....	.....	
13,200	66,000	.017400	.004150	.....	.....	
13,600	68,000	.021800	.004400	.....	.....	
14,000	70,000	.027250	.005450	.....	.....	
14,400	72,000	.033500	.006250	.....	.....	
14,800	74,000	.0400	.0065	.....	.....	
15,200	76,000	.0500	.0100	.....	.....	
15,600	78,000	.0600	.0100	.....	.....	
16,000	80,000	.0800	.0200	.....	.....	
16,400	82,000	.1000	.0200	.....	.....	
16,800	84,000	.1250	.0250	.....	.....	
17,200	86,000	.1550	.0300	.....	.....	
17,600	88,000	.1850	.0300	.....	.....	
18,000	90,000	.2700	.0850	.....	.....	
18,070	90,350	.3150	.0450	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	90,350
Elastic limit per square inch of original section	do....	50,000
Elongation per inch after rupture	inch..	0.3500
Elongation per inch under strain at elastic limit	do....	.003050
Reduction in diameter at point of rupture	do....	.125
Reduction in area after rupture, per centum of original section		43.3
Position of rupture		at middle of stem at center punch mark
Character of broken surface		fine silky
Elongation of inch sections		34a .36b

No. 3646.

Marks, 2.
Diameter, ".505.
Sectional area, .20 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
200	1,000	0.	0.	0.	0.	Initial load.
1,000	5,000	.000200	.000200	.....	.....	
2,000	10,000	.000500	.000300	.....	.....	
3,000	15,000	.000800	.000300	.....	.....	
4,000	20,000	.001100	.000300	.....	.....	
5,000	25,000	.001400	.000300	.....	.....	
6,000	30,000	.001800	.000400	.....	.....	
7,000	35,000	.002050	.000250	.....	.....	
8,000	40,000	.002400	.000350	—.000050	—.000050	
9,000	45,000	.002750	.000350	.....	.....	
9,400	47,000	.002900	.000150	.....	.....	
9,600	48,000	.003000	.000100	.....	.....	
9,800	49,000	.003250	.000250	.....	.....	
10,000	50,000	.003400	.000150	.....	.....	
10,200	51,000	.003550	.000150	.....	.....	
10,400	52,000	.003650	.000100	.....	.....	Elastic limit.
10,600	53,000	.003900	.000250	.....	.....	
10,800	54,000	.004100	.000200	.....	.....	
11,000	55,000	.004450	.000350	.....	.....	
11,200	56,000	.004900	.000450	.....	.....	
11,400	57,000	.005650	.000750	.....	.....	
11,600	58,000	.006400	.000750	.....	.....	
11,800	59,000	.007250	.000850	.....	.....	
12,000	60,000	.008150	.000900	.....	.....	
12,400	62,000	.011300	.003150	.....	.....	
12,800	64,000	.014400	.003100	.....	.....	
13,200	66,000	.017650	.003250	.....	.....	
13,600	68,000	.022400	.004750	.....	.....	
14,000	70,000	.027650	.005250	.....	.....	
14,400	72,000	.034400	.006750	.....	.....	
14,800	74,000	.042000	.007600	.....	.....	
15,200	76,000	.053650	.011650	.....	.....	
15,600	78,000	.066500	.012850	.....	.....	
16,000	80,000	.0850	.0185	.....	.....	
16,400	82,000	.1000	.0150	.....	.....	
16,800	84,000	.1150	.0150	.....	.....	
17,200	86,000	.1500	.0350	.....	.....	
17,600	88,000	.1900	.0400	.....	.....	
18,000	90,000	.2700	.0800	.....	.....	
18,030	90,150	.3150	.0450	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	90,150
Elastic limit per square inch of original section	do....	52,000
Elongation per inch after rupture	inch..	0.3300
Elongation per inch under strain at elastic limit	do....	.003650
Reduction in diameter at point of rupture	do....	.095
Reduction in area after rupture, per centum of original section		34.0
Position of rupture	at middle of stem at center punch mark.	
Character of broken surface	fine; silky.	
Elongation of inch sections	".85°, ".31°	

TEN PER CENT. ALUMINUM BRONZE, MANUFACTURED BY THE COWLES ELECTRIC SMELTING AND ALUMINUM COMPANY.

Specimens cut from a ring 14″ diameter by 1″.85 × 1″.85 cross-section dimensions.

Two specimens cut from ring in the condition it was received at the Watertown Arsenal.

Two specimens (marked H) cut from a sector of a ring which was straightened while at cherry-red heat.

No. 1375.

Diameter, ″.564.
Sectional area, .25 square inch.
Gauged length, 3″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000167	.000167	0.	.....	
2,500	10,000	.000500	.000333	0.	.....	
3,750	15,000	.000800	.000300	0.	.....	
5,000	20,000	.001100	.000300	0.	.....	
6,250	25,000	.001433	.000333	0.	.....	
7,500	30,000	.002067	.000634	.000267	.000267	
7,750	31,000	.002133	.000066	.....	.....	Elastic limit not well defined.
8,000	32,000	.002267	.000134	.....	.....	
8,250	33,000	.002400	.000133	.....	.....	
8,500	34,000	.002567	.000167	.....	.....	
8,750	35,000	.002667	.000100	.000500	.000233	
9,000	36,000	.002800	.000133	.....	.....	
9,250	37,000	.002933	.000133	.....	.....	
9,500	38,000	.003167	.000234	.....	.....	
9,750	39,000	.003300	.000133	.....	.....	
10,000	40,000	.003533	.000233	.000933	.000433	
10,250	41,000	.003667	.000134	.....	.....	
10,500	42,000	.003833	.000166	.....	.....	
10,750	43,000	.003967	.000134	.....	.....	
11,000	44,000	.004233	.000266	.....	.....	
11,250	45,000	.004533	.000300	.....	.....	
11,500	46,000	.004733	.000200	.....	.....	
11,750	47,000	.005000	.000267	.....	.....	
12,000	48,000	.005333	.000333	.....	.....	
12,250	49,000	.005567	.000234	.....	.....	
12,500	50,000	.005933	.000366	.....	.....	
13,000	52,000	.006667	.000734	.....	.....	
13,500	54,000	.007267	.000600	.....	.....	
14,000	56,000	.008067	.000800	.....	.....	
14,500	58,000	.008933	.000866	.....	.....	
15,000	60,000	.009900	.000967	.004733	.003800	
15,500	62,000	.010500	.000600	.....	.....	
16,000	64,000	.012100	.001600	.....	.....	
16,500	66,000	.013400	.001300	.....	.....	
17,000	68,000	.015067	.001667	.....	.....	
17,500	70,000	.017167	.002100	.....	.....	
18,000	72,000	.019833	.002666	.....	.....	
18,500	74,000	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	74,000
Elastic limit per square inch of original section	do....	31,000
Elongation per inch after rupture	inch..	0.0100
Elongation per inch under strain at elastic limit	do....	.002133
Reduction in diameter at point of rupture	do....	.014
Reduction in area after rupture, per centum of original section	.....	5.0
Position of rupture	″.55 from neck	
Character of broken surface	light lavender color, flaky surface.	
Elongation of inch sections	″.01, ″.01, ″.01*	

No. 1376.

Diameter, ″.564.
Sectional area, .25 square inch.
Gauged length, 3″.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000233	.000233	0.	.....	
2,500	10,000	.000567	.000334	0.	.....	
3,750	15,000	.000833	.000266	0.	.....	
5,000	20,000	.001200	.000367	0.	.....	
6,250	25,000	.001533	.000333	.000033	.000033	
6,500	26,000	.001567	.000034	.....	.....	
6,750	27,000	.001700	.000133	.....	.....	
7,000	28,000	.001833	.000133	.....	.....	
7,250	29,000	.001933	.000100	.....	.....	
7,500	30,000	.002067	.000134	.000300	.000267	
7,750	31,000	.002267	.000200	.....	.....	
8,000	32,000	.002333	.000066	.....	.....	
8,250	33,000	.002433	.000100	.....	.....	
8,500	34,000	.002633	.000200	.....	.....	
8,750	35,000	.002733	.000100	.000567	.000267	
9,000	36,000	.002900	.000167	.....	.....	
9,250	37,000	.003067	.000167	.....	.....	
9,500	38,000	.003233	.000166	.....	.....	
9,750	39,000	.003367	.000134	.....	.....	
10,000	40,000	.003600	.000233	.000967	.000400	
10,500	42,000	.003900	.000300	.....	.....	
11,000	44,000	.004367	.000467	.....	.....	
11,500	46,000	.004933	.000566	.....	.....	
12,000	48,000	.005500	.000567	.....	.....	
12,500	50,000	.006000	.000500	.002367	.001400	
13,000	52,000	.006367	.000367	.....	.....	
13,500	54,000	.007167	.000800	.....	.....	
14,000	56,000	.008000	.000833	.....	.....	
14,500	58,000	.008900	.000900	.....	.....	
15,000	60,000	.010067	.001167	.004767	.001400	
15,500	62,000	.010567	.000500	.....	.....	
16,000	64,000	.011933	.001366	.....	.....	
17,500	70,000	.0167	.004767	.....	.....	
18,850	75,400	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	75,400
Elongation per inch after rupture	inch..	0.0167
Reduction in diameter at point of rupture	do...	.014
Reduction in area after rupture, per centum of original section		5.0
Position of rupture		1″.45 from neck.
Character of broken surface		light lavender color, flaky surface.
Elongation of inch sections		″.01, ″.03, ″.01.

No. 1378.

Mark, H.
Diameter, ".564.
Sectional area, .25 square inch.
Gauged length, 3".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	.....	Initial load.
1,250	5,000	.000300	.000300	0.	.....	
2,500	10,000	.000633	.000333	0.	.....	
3,750	15,000	.000933	.000300	0.	.....	
5,000	20,000	.001300	.000367	0.	.....	
6,250	25,000	.001633	.000333	0.	.....	
6,500	26,000	.001667	.000034	.....	.....	
6,750	27,000	.001733	.000066	.....	.....	
7,000	28,000	.001833	.000100	.....	.....	
7,250	29,000	.001967	.000134	.....	.....	
7,500	30,000	.002067	.000100	.000200	.000200	
7,750	31,000	.002167	.000100	.....	.....	
8,000	32,000	.002300	.000133	.....	.....	
8,250	33,000	.002400	.000100	.....	.....	
8,500	34,000	.002500	.000100	.....	.....	
8,750	35,000	.002633	.000133	.000333	.000133	
9,000	36,000	.002800	.000167	.....	.....	
9,250	37,000	.002900	.000100	.....	.....	
9,500	38,000	.003133	.000233	.....	.....	
9,750	39,000	.003333	.000200	.....	.....	
10,000	40,000	.003500	.000167	.000733	.000400	
10,500	42,000	.003767	.000267	.....	.....	
11,000	44,000	.004200	.000433	.....	.....	
11,500	46,000	.004600	.000400	.....	.....	
12,000	48,000	.005100	.000500	.....	.....	
12,500	50,000	.005567	.000467	.001833	.001100	
13,000	52,000	.006100	.000533	.....	.....	
13,500	54,000	.006700	.000600	.....	.....	
14,000	56,000	.007467	.000767	.....	.....	
14,500	58,000	.008233	.000766	.....	.....	
15,000	60,000	.009000	.000767	.003700	.001867	
15,500	62,000	.009600	.000600	.....	.....	
16,000	64,000	.010800	.001200	.....	.....	
16,500	66,000	.012000	.001200	.....	.....	
17,000	68,000	.013233	.001233	.....	.....	
18,000	72,000	.0150	.001767	.....	.....	
19,000	76,000	.0200	.0050	.....	.....	
19,980	79,920	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section	pounds..	79,920
Elongation per inch after rupture	inch..	0.0200
Reduction in diameter at point of rupture	do...	.014
Reduction in area after rupture, per centum of original section		5.0
Position of rupture		".55 from neck.
Character of broken surface		light lavender color, flaky surface.
Elongation of inch sections		".03", ".02, ".01

No. 1379.

Mark, H.
Diameter, ".564.
Sectional area, .25 square inch.
Gauged length, 3".

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000200	.000200	0.	.....	
2,500	10,000	.000533	.000333	0.	.....	
3,750	15,000	.000833	.000300	0.	.....	
5,000	20,000	.001167	.000334	0.	.....	
6,250	25,000	.001533	.000366	.000033	.00003?	
6,500	26,000	.001633	.000100	.....	.....	
6,750	27,000	.001667	.000034	.....	.....	
7,000	28,000	.001800	.000133	.....	.....	
7,250	29,000	.001900	.000100	.....	.....	
7,500	30,000	.002067	.000167	.000233	.000200	
7,750	31,000	.002200	.000133	.....	.....	
8,000	32,000	.002333	.000133	.....	.....	
8,250	33,000	.002433	.000100	.....	.....	
8,500	34,000	.002667	.000234	.....	.....	
8,750	35,000	.002800	.000133	.000500	.000267	
9,000	36,000	.002867	.000067	.....	.....	
9,250	37,000	.003000	.000133	.....	.....	
9,500	38,000	.003267	.000267	.....	.....	
9,750	39,000	.003333	.000066	.....	.....	
10,000	40,000	.003667	.000334	.000900	.000400	
10,500	42,000	.004033	.000366	.....	.....	
11,000	44,000	.004533	.000500	.....	.....	
11,500	46,000	.005100	.000567	.....	.....	
12,000	48,000	.005567	.000467	.....	.....	
12,500	50,000	.006100	.000533	.002233	.001300	
13,000	52,000	.006600	.000500	.....	.....	
13,500	54,000	.007567	.000967	.....	.....	
14,000	56,000	.008133	.000566	.....	.....	
14,500	58,000	.009067	.000934	.....	.....	
15,000	60,000	.010100	.001033	.004633	.002400	
15,500	62,000	.010667	.000567	.....	.....	
16,000	64,000	.011800	.001133	.....	.....	
16,500	66,000	.013267	.001467	.....	.....	
17,500	68,000	.0150	.001733	.....	.....	
18,500	70,000	.0200	.0050	.....	.....	
19,100	76,400	.....	.....	.....	.....	Tensile strength.

General summary.

Tensile strength per square inch of original section.....pounds..	76,400
Elongation per inch after rupture.....inch..	0.0133
Reduction in diameter at point of rupture.....do....	.014
Reduction in area after rupture, per centum of original section.....	5.0
Position of rupture.....1".35 from neck.	
Character of broken surface...light lavender color; flaky, radiating from a point near the circumference.	
Elongation of inch sections.....".01, ".02, ".01.	

BRONZE SPECIMENS FROM WATERVLIET ARSENAL

Composition: Cu. 88, Su. 10. Zn. 2.

Specimens taken from a casting weighing 107 pounds, for the console of the breech mechanism of sea-coast guns.

No. 3690.

Mark, 1.
Diameter, ".564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000267	.000267	0.	.....	
2,500	10,000	.000900	.000633	0.	.....	
2,750	11,000	.001000	.000100	.....	.....	
3,000	12,000	.001100	.000100	.....	.....	Elastic limit.
3,250	13,000	.001367	.000267	.....	.....	
3,500	14,000	.002333	.000966	.....	.....	
3,750	15,000	.003833	.001500	.002667	.002667	
4,000	16,000	.007800	.003767	.....	.....	
4,250	17,000	.011667	.004067	.....	.....	
4,500	18,000	.018233	.006566	.....	.....	
4,750	19,000	.025500	.007267	.....	.....	
5,000	20,000	.036833	.011333	.....	.....	
5,250	21,000	.046533	.009700	.....	.....	
5,500	22,000	.061667	.015133	.....	.....	
5,750	23,000	.072833	.011166	.....	.....	
6,000	24,000	.091667	.018833	.....	.....	
6,250	25,000	.1100	.018333	.....	.....	
6,380	25,520	.....	.....	.....	.....	Tensile strength.

General summary.

Specific gravity (porous)		8.1892
Hardness		3.33–
Tensile strength per square inch of original section	pounds..	25,520
Elastic limit per square inch of original section	do....	12,000
Elongation per inch after rupture	inch..	0.1233
Elongation per inch under strain at elastic limit	do....	.001100
Reduction in diameter at point of rupture	do....	.044
Reduction in area after rupture, per centum of original section		15.0
Position of rupture		½" from neck.

Character of broken surface, irregular, spongy. Color varies from lavender and light yellow to dark copper color. Surface cracks developed along the stem.

Elongations of inch sections ..... ".15*, ".12, ".10.

No. 3691.

Marks, 2.
Diameter, ".564.
Sectional area, .25 square inch.

Applied loads.		Elongation per inch.	Successive elongation per inch.	Permanent set.	Successive permanent set.	Remarks.
Total.	Per square inch.					
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
250	1,000	0.	0.	0.	0.	Initial load.
1,250	5,000	.000333	.000333	0.		
2,500	10,000	.000867	.000534	.000033	.000033	
2,750	11,000	.000933	.000066			
3,000	12,000	.001100	.000167			Elastic limit.
3,250	13,000	.001433	.000333			
3,500	14,000	.002367	.000934			
3,750	15,000	.003367	.001000			
4,000	16,000	.005867	.002500			
4,250	17,000	.008800	.002933			
4,500	18,000	.014667	.005867			
4,750	19,000	.020000	.005333			
5,000	20,000	.029667	.009667			
5,250	21,000	.038000	.008333			
5,500	22,000	.049833	.011833			
5,750	23,000	.059000	.009167			
6,000	24,000	.073667	.014667			
6,250	25,000	.0867	.013033			
6,500	26,000	.1000	.0133			
6,750	27,000	.1133	.0133			
7,000	28,000	.1333	.0200			
7,250	29,000	.1533	.0200			
7,260	29,040					Tensile strength.

General summary.

Specific gravity		8.3192
Hardness		3.33
Tensile strength per square inch of original section	pounds.	29,040
Elastic limit per square inch of original section	do.	12,000
Elongation per inch after rupture	inch.	0.1600
Elongation per inch under strain at elastic limit	do.	.001100
Reduction in diameter at point of rupture	do.	.064
Reduction in area after rupture, per centum of original section		21.4
Position of rupture		¾" from neck.

Character of broken surface, irregular color, varies from lavender and light yellow to dark yellow, the light yellow preponderating. Surface cracks developed along the stem.
Elongation of inch sections ".20", ".14, ".14

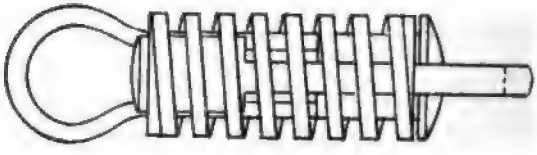
SPRING TUG LINKS.

TESTED FOR

MAJOR E. B. WILLISTON, U. S. A.

719

Style of link.



H Ex 45 50 2

No. 1.

Size of wire, ″.15×″.20.
Outside diameter of spring, 1″.24.
Space between coils, ″.20.
Length of spring, 2″.70.

Applied loads.	Length of spring.	Remarks.
Pounds.	*Inches.*	
0	2.70	
350	1.89	
405	1.78	Spring closed down.
6,150	.....	Tensile strength.

Fractured one leg of stem of smaller loop within the spring.

No. 2.

Size of wire, ″.18×″.20.
Outside diameter of spring, 1″.37.
Space between coils, ″.20
Length of spring, 3″.45.

Applied loads.	Length of spring.	Remarks.
Pounds.	*Inches.*	
0	3.45	
350	2.65	
500	2.37	
540	2.32	Spring closed down.
4,130	.....	Tensile strength.

Fractured one side of larger looped end opposite end of spring.

No. 3.

Size of wire, ″.24×″.24.
Outside diameter of spring, 1″.50.
Space between coils, ″.18.
Length of spring, 3″.37.

Applied loads.	Length of spring.	Remarks.
Pounds.	*Inches.*	
0	3.37	
350	2.98	
650	2.58	
770	2.48	Spring closed down.
3,820	.....	Tensile strength.

Fractured end of malleable iron link, tearing off button from end of one leg.
Fractured surface showed a defective spot in the metal.

TENSILE TESTS

OF

NEAT CEMENT BRIQUETTES

FOR

J. L. SMITHMEYER,

ARCHITECT CONGRESSIONAL LIBRARY BUILDING, WASHINGTON, D. C.

723

The briquettes were made from a medium stiff cement paste, and set one day in air and six days in water.

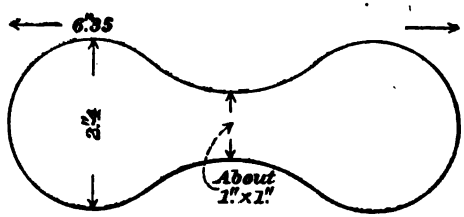
Notes on the initial setting of the cement.

Observations were made by means of a loaded wire, ".0127 diameter =.01267 square inch, noting the times when the cement had set sufficiently to support a wire loaded with 50 and 500 pounds per square inch respectively.

INITIAL SETTING OF CEMENT.

Brand of cement.	Marks.	Supports, weight of.		Remarks.
		50 pounds per sq. inch.	500 pounds per sq. inch.	
Knight, Bevan & Sturge..	No. 2, barrel O	12 minutes..	31 minutes..	
Do	No. 4, barrel O	12 minutes..	39 minutes..	
Do	No. 5, barrel O ..	20 minutes..	46 minutes..	
		15 minutes..	33 minutes..	Mixed rather stiff.
Black Cross.....	No. 1, barrel X	9 minutes..	44 minutes..	
Do	No. 5, barrel X	5 minutes..	56 minutes..	
Do	No. 6, barrel X ..	8 minutes	12 minutes..	
		4 minutes..	13 minutes..	Mixed thin.

TENSILE TESTS.



No. of test.	Marks.	Dimensions.	Sectional area.	Tensile strength.		Position of fracture.
				Total.	Per sq. inch.	
		" "	*Sq. inch.*	*Pounds.*	*Pounds.*	
1723	No. 2, barrel O.....	1.00×1.02	1.02	308	302	In neck.
1724	.....do	1.00×1.02	1.02	309	303	Do.
1725	No. 4, barrel O	1.00×1.02	1.02	347	340	Do.
1726	.....do	.98×1.05	1.03	375	364	Do.
1727	No., 4, barrel X.....	.99×1.01	1.00	185	185	At middle.
1728	.....do	.99×1.04	1.03	214	208	Do.
1729	No. 5, barrel O.....	.99×1.01	1.00	305	305	In neck.
1730	.....do	.99×1.04	1.03	284	276	Do.
1731	No. 5, barrel X.....	.98×1.01	.99	234	236	At middle.
1732	.....do	.98×1.03	1.01	205	203	In neck.
1733	No. 6, barrel X.....	.99×1.00	.99	210	212	Do.
1734	.....do	.99×1.04	1.03	195	190	Do.

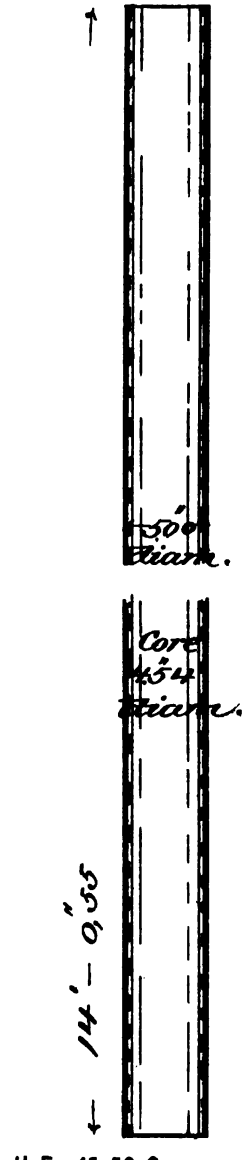
COMPRESSION

OF

IRON MILL COLUMNS.

MATERIAL FURNISHED BY PROF. G. LANZA, MASSACHUSETTS INSTITUTE OF TECHNOLOGY, AND MR. W. E. PARKER, SUPERINTENDENT PACIFIC MILLS, LAWRENCE, MASS.

No. 1374



H Ex 45 50 2

Wrought iron.

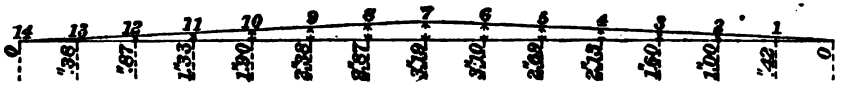
No. 1374.

Weight, 160½ pounds.
Sectional area, 3.497 square inches.
Gauged length, 50″.

Applied loads.		In gauged length.		Deflections at middle.		Remarks.
Total.	Per square inch.	Compression.	Set.	Horizontal.	Vertical.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inches.*	*Inches.*	
3,497	1,000	0.	0.	0.	0.	Initial load.
6,994	2,000	.0019	.....	0.	0.	
10,491	3,000	.0036	.....	0.	0.	
13,988	4,000	.0054	.....	0.	0.	
17,485	5,000	.0074	.0002	0.	0.	
20,982	6,000	.0092	.....	0.	0.	
24,479	7,000	.0113	.....	0.	0.	
27,976	8,000	.0130	.....	0.	0.	
31,473	9,000	.0147	.....	0.	0.	
34,970	10,000	.0165	—.0007	0.	0.	
38,467	11,000	.0178	.....	0.	0.	
41,964	12,000	.0194	.....	0.	.02	
45,461	13,000	.0214	.....	0.	.02	
48,958	14,000	.0236	.....	0.	.02	
52,455	15,000	.0249	—.0008	.02	.02	
55,952	16,000	.0264	.....	.02	.02	
59,449	17,000	.0282	.....	.02	.02	
62,946	18,000	.0302	.....	.02	.02	
66,443	19,000	.0320	.....	.02	.02	
69,940	20,000	.0339	—.0003	.02	.02	
73,437	21,000	.0359	.....	.02	.02	
76,934	22,000	.0379	.....	.02	.02	
80,431	23,000	.0402	.....	.02	.02	
83,928	24,000	.0421	.....	.02	.02	
87,425	25,000	.0444	.0010	.02	.02	
90,922	26,000	.0469	.....	.03	.02	
94,419	27,000	.0496	.....	.03	.02	
97,916	28,000	.0524	.....	.04	—.02	
101,413	29,000	.0575	.....	.07	—.07	
104,400	29,854	.....	.....	.17	—.38	Ultimate strength.
91,500	26,165	.....	.....	.19	—.41	Load sustained 15 hours.
104,400	29,854	.....	.....	.20	—.45	
111,400	31,856	.....	.....	.23	—.55	Maximum load after above rest.
94,000	26,880	.....	.....	.52	—1.20	
85,000	24,307	.....	.....	.75	—1.80	
73,000	20,875	.....	.....	1.20	—3.25	

Failed by triple flexure.

Ordinates measured after post was removed from machine, showing curve of permanent deflection.



Cast iron.

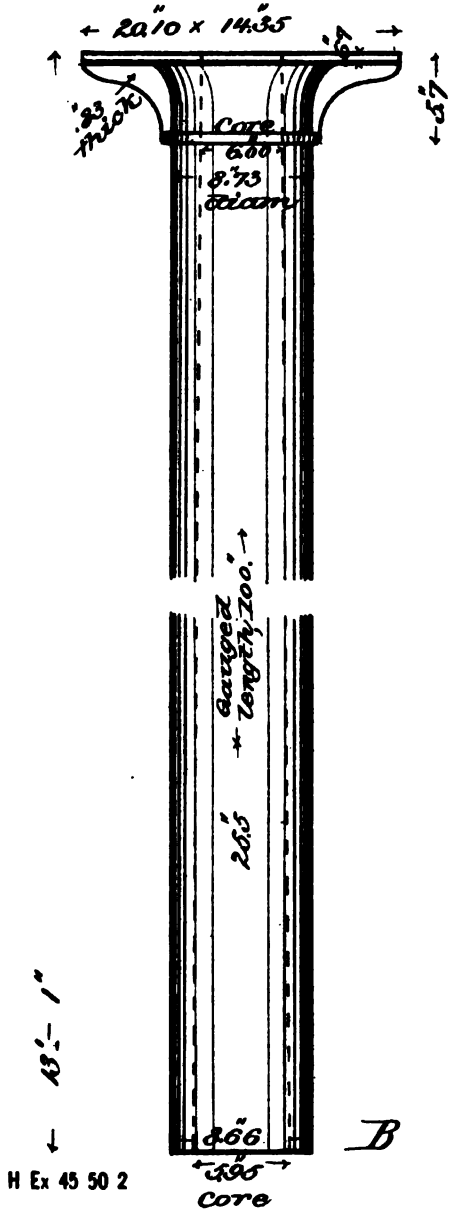
No. 2000.

Weight, 1,346 pounds.
Sectional area at base, 31.10 square inches.
Gauged length, 100″.
Core at end B eccentric, ″.05.

Applied loads.		In gauged length.		Deflections at middle.		Remarks.
Total.	Per square inch.	Compression.	Set.	Horizontal.	Vertical.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inches.*	
10,000	.....	0.	0.	0.	0.	Initial load.
20,000	.....	.0013	.....	0.	0.	
40,000	.....	.0054	.....	0.	0.	Deflection sets.
60,000	.....	.0094	.....	0.	0.	Horizontal. Vertical.
80,000	.....	.0136	.....	0.	0.	
100,000	.....	.0183	.0008	.02	.02	″.02 .00
140,000	.....	.0275	.....	.02	.02	
180,000	.....	.0373	.....	.02	.02	
200,000	.....	.0422	.0027	.02	.02	.02 0
240,000	.....	.0523	.....	.03	.03	
280,000	.....	.0626	.....	.04	.03	
300,000	.....	.0678	.0054	.04	.03	.03 ″.02
340,000	.....	.0784	.....	.04	.03	
380,000	.....	.0891	.....	.04	.03	
400,000	.....	.0948	.0090	.04	.03	.02 .02
440,000	.....	.1061	.....	.05	.03	
480,000	.....	.1180	.....	.05	.03	
500,000	.....	.1245	.0150	.05	.03	.02 .02
540,000	.....	.1373	.....	.06	.03	
580,000	.....	.1513	.0228	.07	.06	.03 .03
600,000	.....	.....	.....	.07	.06	
640,000	.....	.....	.....	.06	.06	
680,000	.....	.....	.....	.07	.06	
700,000	.....	.....	.....	.07	.06	
720,000	.....	.....	.....	.08	.07	
740,000	.....	.....	.....	.08	.07	
760,000	.....	.....	.....	.09	.08	
780,000	.....	.....	.....	.10	.08	
800,000	25,720	.....	.....	.11	.08	
Do....	.....	.....	.....	.13	.09	After 5 minutes.
Do....	.....	.....	.....	.13	.10	After 10 minutes.
Do....	.....	.....	.....	.14	.10	After 15 minutes.
Do....	.....	.....	.....	.14	.10	After 20 minutes.
Do....	.....	.....	.....	.14	.10	After 25 minutes.

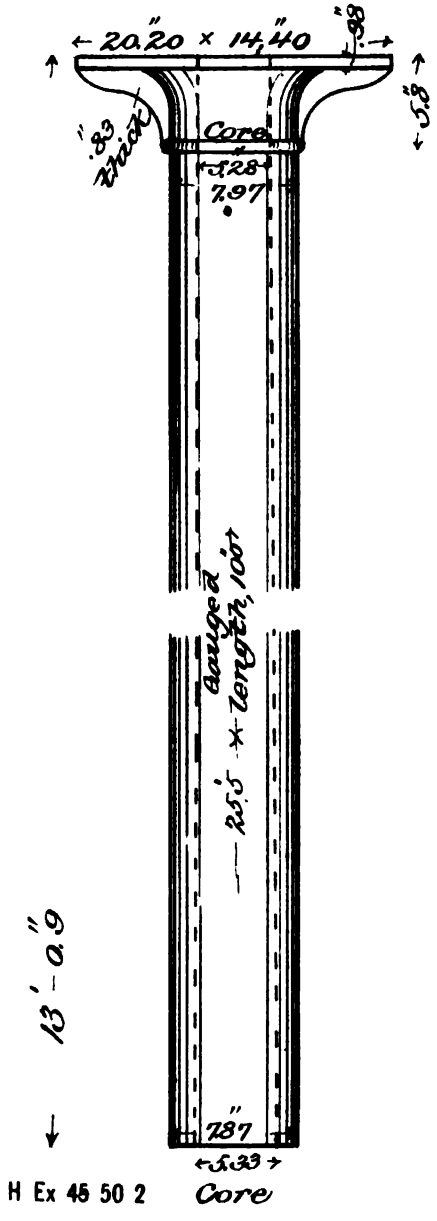
Test discontinued.

No. 2000



H Ex 45 50 2

No. 2001



H Ex 45 50 2

Cast iron.

No. 2001.

Weight, 1,170 pounds.
Sectional area at base, 26.33 square inches.
Gauged length, 100″.

Applied loads.		In gauged length.		Deflections at middle.		Remarks.
Total.	Per square inch.	Compression.	Set.	Horizontal.	Vertical.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
10,000	.....	0.	0.	0.	0.	Initial load.
20,000	.....	.0022	.....	0.	0.	
40,000	.....	.0077	.....	0.	0.	
60,000	.....	.0130	.....	0.	0.	Deflection sets.
80,000	.....	.0190	.....	0.	0.	Horizontal. Vertical.
100,000	.....	.0218	.0018	0.	0.	0 0
140,000	.....	.0372	.....	0.	0.	
180,000	.....	.0500	.....	0.	−.02	
200,000	.....	.0565	.0048	0.	−.02	0 0
240,000	.....	.0697	.....	0.	−.02	
280,000	.....	.0830	.....	0.	−.03	
300,000	.....	.0898	.0083	0.	−.03	0 0
340,000	.....	.1035	.....	+.02	−.03	
380,000	.....	.1180	.....	+.03	−.04	
400,000	.....	.1247	.0130	.03	−.04	0 0
440,000	.....	.1391	.....	.03	−.05	
480,000	.....	.1547	.....	.04	−.05	
500,000	.....	.1628	.0200	.04	−.06	0 0
540,000	.....	.1794	.....	.06	−.07	
580,000	.....	.1972	.....	.06	−.08	
600,000	.....	.2072	.0320	.07	−.09	+″.02 −″.03
620,000	.....	.....	.....	.07	−.10	
640,000	.....	.....	.....	.08	−.10	
660,000	.....	.....	.....	.08	−.11	
680,000	.....	.....	.....	.09	−.11	
700,000	.....	.....	.....	.10	−.12	
720,000	.....	.....	.....	.10	−.14	
740,000	.....	.....	.....	.12	−.16	
760,000	.....	.....	.....	.12	−.18	
780,000	.....	.....	.....	.14	−.22	
790,000	.....	.....	.....	.15	−.23	
800,000	30,380	.....	.....	.16	−.24	
....Do....	.....	.....	.....	.17	−.28	After 2 minutes.
....Do....	.....	.....	.....	.18	−.28	After 5 minutes.
....Do....	.....	.....	.....	.18	−.29	After 10 minutes.
....Do....	.....	.....	.....	.19	−.30	After 15 minutes.
....Do....	.....	.....	.....	.19	−.31	After 20 minutes.
....Do....	.....	.....	.....	.19	−.31	After 25 minutes.
....Do....	.....	.....	.....	.19	−.31	After 30 minutes.
10,000	.....	.....	.1195	.....	.....	

Test discontinued.

Cast iron.

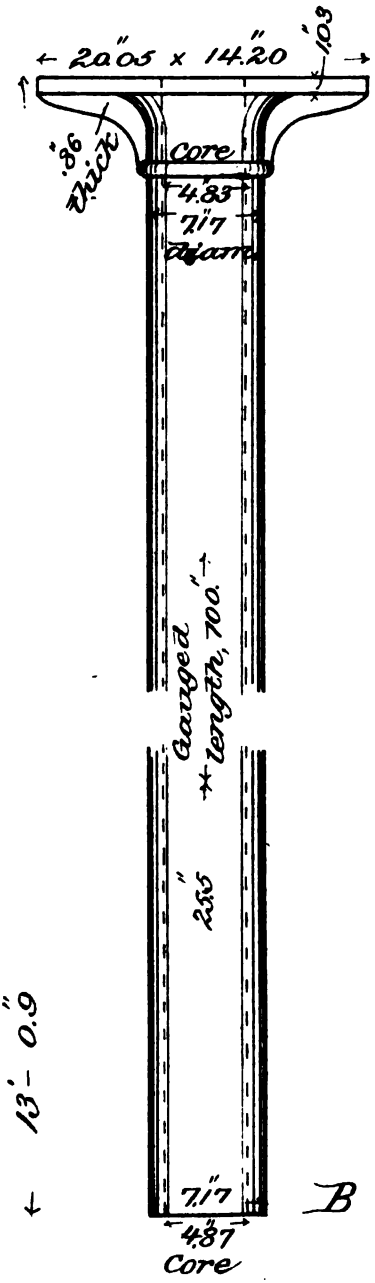
No. 2002.

Weight, 959 pounds.
Sectional area at base, 21.75 square inches.
Gauged length, 100″.
Core eccentric at end B ″.05.

Applied loads.		In gauged length.		Deflections at middle.		Remarks.
Total.	Per square inch.	Compression.	Set.	Horizontal.	Vertical.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inches.*	*Inch.*	
10,000	.....	0.	0.	0.	0.	Initial load.
20,000	.....	.0034	.....	0.	0.	
40,000	.....	.0113	.....	0.	0.	
60,000	.....	.0196	.....	0.	0.	Deflection sets.
80,000	.....	.0282	.....	0.	0.	Horizontal. Vertic
100,000	.....	.0373	.0032	0.	0.	0 0
120,000	.....	.0468	.....	0.	0.	
140,000	.....	.0566	.....	0.	0.	
160,000	.....	.0668	.....	0.	0.	
180,000	.....	.0770	.....	0.	0.	
200,000	.....	.0880	.0112	0.	0.	0 0
220,000	.....	.0985	.....	—.01	0.	
240,000	.....	.1099	.....	—.02	0.	
260,000	.....	.1213	.....	—.02	0.	
280,000	.....	.1337	.....	—.03	0.	
300,000	.....	.1467	.0253	—.03	0.	0
320,000	.....	.1595	.....	—.04	0.	
340,000	.....	.1733	.....	—.05	—.01	
360,000	.....	.1877	.....	—.06	—.02	
380,000	.....	.2034	.....	—.06	—.02	
400,000	.....	.2215	.0540	—.07	—.03	—″.02
420,000	.....	.....	.....	—.09	—.03	
440,000	.....	.....	.....	—.11	—.04	
460,000	.....	.....	.....	—.14	—.06	
480,000	.....	.....	.....	—.18	—.07	
500,000	.....	.....	.....	—.25	—.10	
510,000	.....	.....	.....	—.31	—.13	
520,000	.....	.....	.....	—.38	—.16	
530,000	.....	.....	.....	—.48	—.20	
540,000	.....	.....	.....	—.65	—.25	
541,500	.....	.....	.....	—.67	—.27	
540,000	.....	.....	.....	—.73	—.28	
	.....	.....	.....	—.75	—.30	
544,000	.....	.....	.....	—.80	—.30	
544,400	.....	.....	.....	—.84	—.30	
545,500	.....	.....	.....	—.86	—.31	
546,400	.....	.....	.....	—.90	—.34	
	.....	.....	.....	—.93	—.34	
	.....	.....	.....	—.95	—.35	
548,000	.....	.....	.....	—.97	—.35	
549,000	.....	.....	.....	—.98	—.36	
550,000	.....	.....	.....	—1.00	—.37	
550,500	.....	.....	.....	—1.03	—.37	
550,600	.....	.....	.....	—1.08	—.38	
550,640	.....	.....	.....	—1.11	—.40	
551,000	.....	.....	.....	—1.14	—.40	
552,000	.....	.....	.....	—1.18	—.41	
553,000	.....	.....	.....	—1.21	—.42	
554,000	25,470	.....	.....	—1.25	—.43	
553,800	.....	.....	.....	—1.30	—.45	Ulti
553,600	.....	.....	.....	—1.33	—.46	
553,000	.....	.....	.....	—1.37	—.46	
552,000	.....	.....	.....	—1.43	—.46	
10,000	.....	.....	.2870	—1.52	—.50	
				—1.03	—.33	

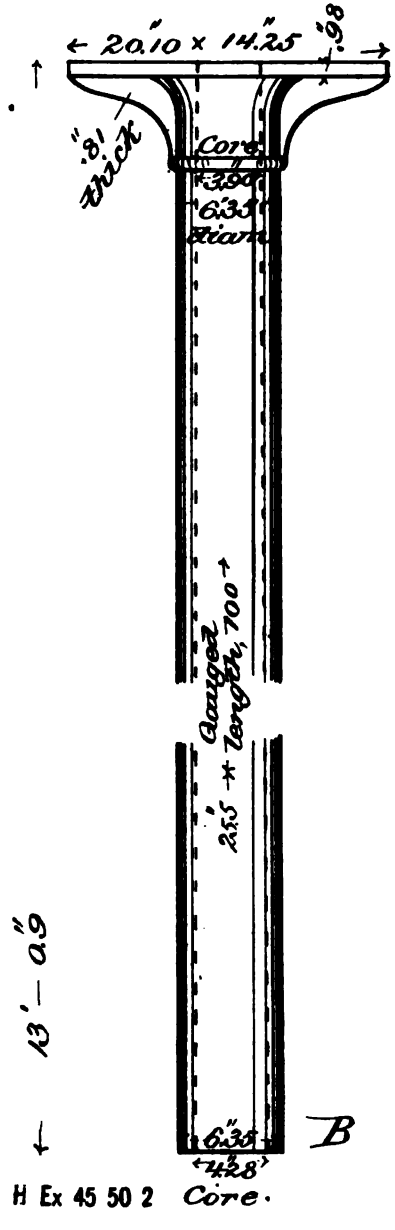
Failed by triple flexure. The post was concave fore testing; failure occurred by increasing this in the casting.

No. 2002



H Ex 45 50 2

No. 2003



H Ex 45 50 2 Core.

Cast iron.

No. 2003.

Weight, 779 pounds.
Sectional area at base, 17.28 square inches.
Gauged length, 100″.
Core eccentric at end B ″.10.

Applied loads.		In gauged length.		Deflections at middle.		Remarks.	
Total.	Per square inch.	Compression.	Set.	Horizontal.	Vertical.		
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inches.*	*Inches.*		
10,000	.....	0.	0.	0.	0.	Initial load.	
20,000	.....	.0034	.....	0.	0.		
40,000	.....	.0113	.....	0.	0.		
60,000	.....	.0193	.....	0.	0.	Deflection sets.	
80,000	.....	.0280	.....	0.	0.	Horizontal.	Vertical.
100,000	.....	.0368	.0025	— .01	+ .02	0	0″
120,000	.....	.0460	.....	— .02	+ .03		
140,000	.....	.0555	.....	— .02	.03		
160,000	.....	.0651	.....	— .03	.03		
180,000	.....	.0748	.....	— .04	.04		
200,000	.....	.0848	.0090	— .04	.04	0	0
220,000	.....	.0948	.....	— .04	.05		
240,000	.....	.1050	.....	— .04	.06		
260,000	.....	.1157	.....	— .05	+ .07		
280,000	.....	.1266	.....	— .05	.07		
300,000	.....	.1387	.0201	— .06	.08	—″.02	0
320,000	.....	.1498	.....	— .10	.08		
340,000	.....	.1615	.....	— .11	.10		
360,000	.....	.1738	.....	— .14	.12		
380,000	.....	.1865	.....	— .17	.14		
400,000	.....	.1992	.0405	— .21	.17	— .07	+″.06
420,000	.....	.....	.....	— .25	.20		
440,000	.....	.....	.....	— .33	.27		
460,000	.....	.....	.....	— .48	.40		
461,000	.....	.....	.....	— .55	.45		
462,000	.....	.....	.....	— .58	.47		
463,000	.....	.....	.....	— .60	.50		
464,000	.....	.....	.....	— .62	.51		
465,000	.....	.....	.....	— .63	.52		
466,000	.....	.....	.....	— .63	.53		
467,000	.....	.....	.....	— .66	.55		
468,000	.....	.....	.....	— .69	.57		
469,000	.....	.....	.....	— .72	.61		
470,000	.....	.....	.....	— .74	.62		
470,100	.....	.....	.....	— .79	.64		
470,200	27,210	.....	.....	— .88	.73	Ultimate strength.	
.....	.....	.....	.....	— .95	.78	After 5 minutes.	
470,000	.....	.....	.....	—1.00	.82		
.....	.....	.....	.....	—1.04	.86	After 5 minutes.	
469,500	.....	.....	.....	—1.09	+ .91		
.....	.....	.....	.....	—1.13	.97	After 5 minutes.	
469,000	.....	.....	.....	—1.14	.98		
.....	.....	.....	.....	—1.18	1.00	After 5 minutes.	
.....	.....	.....	.....	—1.20	1.01	After 10 minutes.	
			Load increased.				
469,500	.....	.....	.....	—1.21	1.01		
.....	.....	.....	.....	—1.25	1.04	After 5 minutes.	
.....	.....	.....	.....	—1.32	1.10	After 10 minutes.	
.....	.....	.....	.....	—1.40	1.16	After 15 minutes.	
.....	.....	.....	.....	—1.52	1.28	After 20 minutes.	
10,000	.....	.....	.....	— .92	.78		

Failed by triple flexure.

Cast iron.

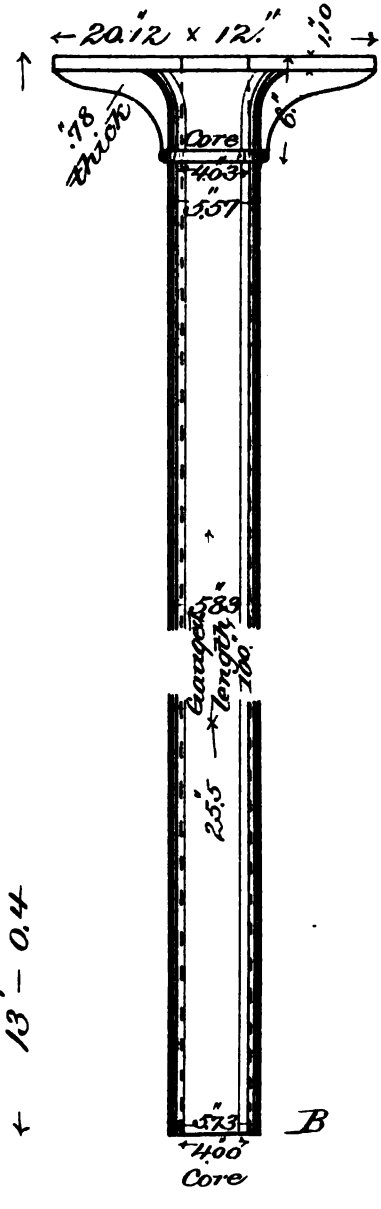
No. 2004.

Weight, 600 pounds.
Sectional area at base, 13.22 square inches.
Gauged length, 100″.
The core is eccentric; the thickness of metal at end B varies from ″.78 to 1″.06.

Applied loads.		In gauged length.		Deflections at middle.		Remarks.
Total.	Per square inch.	Compression.	Set.	Horizontal.	Vertical.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inches.*	
5,000		0.	0.	0.	0.	Initial load.
10,000		.0024		0.	0.	
15,000		.0051		0.	0.	
20,000		.0079		0.	0.	
25,000		.0110		0.	0.	
30,000		.0140		0.	0.	
40,000		.0200		0.	0.	
50,000		.0261		0.	0.	
60,000		.0330		0.	0.	
70,000		.0394		0.	0.	
80,000		.0461		0.	0.	
90,000		.0531		0.	0.	
100,000		.0601	.0042	0.	0.	
110,000		.0671		0.	0.	
120,000		.0746		0.	0.	
130,000		.0819		0.	0.	
140,000		.0896		0.	0.	
150,000		.0971	.0091	0.	0.	
160,000		.1050		0.	0.	
170,000		.1129		0.	0.	
180,000		.1211		0.	0.	
190,000		.1300		0.	0.	
200,000		.1390	.0170	0.	0.	
220,000				0.	0.	
240,000				0.	0.	
260,000				0.	0.	
280,000				—.03	—.05	
285,000				—.03	—.08	
290,000				—.05	—.10	
295,000				—.07	—.12	
300,000				—.08	—.15	
305,000				—.10	—.18	
310,000				—.11	—.23	
315,000				—.13	—.29	
320,000				—.15	—.35	
325,000				—.18	—.40	
5,000				—.10	—.20	
100,000						Rested under this load 15 hours.
5,000				—.10	—.20	
325,000				—.22	—.48	
330,000				—.28	—.64	
331,000				—.30	—.60	
331,500				—.32	—.72	
331,700				—.33	—.79	
331,780	25,100			—.38	—.85	Ultimate strength.
331,700				—.41	—.90	
331,600				—.43	—.93	
331,500				—.42	—.95	
331,400				—.43	—.97	
331,300				—.44	1.00	
5,000				—.23	—.55	

Failed by deflecting.

No. 2004

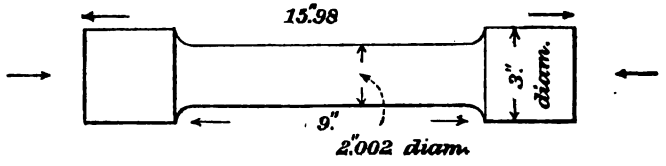


H Ex 45 50 2

CAST-IRON COMPRESSION TESTS.

MATERIAL FURNISHED BY DR. E. D. LEAVITT, JR., CAMBRIDGE, MASS.

Form of specimens.



No. 4690.

Diameter, 2″.002.
Sectional area, 3.148 square inches.
Gauged length, 6″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
3,148	1,000	0.	0.	Initial load.
6,296	2,000	.0003	.....	
9,444	3,000	.0009	.....	
12,592	4,000	.0015	.....	
15,740	5,000	.0021	.0002	
18,888	6,000	.0028	.....	
22,036	7,000	.0033	.....	
25,184	8,000	.0041	.....	
28,332	9,000	.0047	.....	
31,480	10,000	.0053	.0009	
34,628	11,000	.0061	.....	
37,776	12,000	.0068	.....	
40,924	13,000	.0075	.....	
44,072	14,000	.0082	.....	
47,220	15,000	.0090	.0018	
50,368	16,000	.0099	.....	
53,516	17,000	.0105	.....	
56,664	18,000	.0113	.....	
59,812	19,000	.0122	.....	
62,960	20,000	.0131	.0032	
66,108	21,000	.0141	.....	
69,250	22,000	.0150	.....	
72,404	23,000	.0161	.....	
75,552	24,000	.0172	.....	
78,700	25,000	.0185	.0059	
81,848	26,000	.0197	.....	
84,996	27,000	.0210	.....	
88,144	28,000	.0225	.....	
91,292	29,000	.0240	.....	
94,440	30,000	.0260	.0107	
97,588	31,000	.0275	.....	
100,736	32,000	.0295	.....	
103,884	33,000	.0318	.....	
107,032	34,000	.0336	.....	
110,180	35,000	.0363	.0190	
113,328	36,000	.0390	.....	
116,476	37,000	.0415	.....	
119,624	38,000	.0445	.....	
122,772	39,000	.0479	.....	
125,920	40,000	.0510	.0310	E = 11,700,000.
129,068	41,000	.0550	.....	

No. 4690—Continued.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
132,216	42,000	.0602	.....	
135,364	43,000	.0640	.....	
138,512	44,000	.0688	.....	
141,660	45,000	.0747	.0522	
144,808	46,000	.0800	.....	
147,956	47,000	.0860	.....	
151,104	48,000	.0920	.0684	
154,252	49,000	.0988	.....	
157,400	50,000	.1060	.0810	
160,548	51,000	.1124	.....	
163,696	52,000	.1213	.....	
166,844	53,000	.1300	.....	
169,992	54,000	.1405	.....	
173,140	55,000	.1487	.1211	Perceptible deflection.
182,584	58,000	.17	.....	
185,732	59,000	.19	.....	
188,880	60,000	.20	.....	
192,028	61,000	.23	.....	
195,176	62,000	.26	.....	
198,324	63,000	.32	.....	Middle deflection, ".13.
199,600	63,410	.....	.....	Ultimate strength, middle deflection, ".15.

Load of 190,000 pounds on specimen when the test was discontinued; the middle deflection after removal from the testing machine was ".32

Cracks were opened on the tension sides at the middle and ends of the stem, also the heads were cracked by tension fractures at the corners of the inside ends next the necks, and the compression sides of the bends in the stem.

No. 4691.

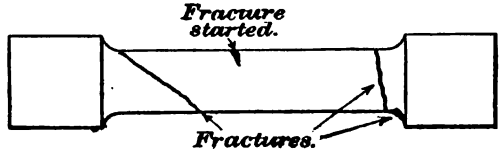
Diameter, 2″.002.
Sectional area, 3.148 square inches.
Gauged length, 6″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
3,148	1,000	0.	0.	Initial load.
6,296	2,000	.0003	.....	
9,444	3,000	.0008	.....	
12,592	4,000	.0013	.....	
15,740	5,000.	.0019	.0001	
18,880	6,000	.0026	.....	
22,036	7,000	.0033	.....	
25,184	8,000	.0039	.....	
28,332	9,000	.0046	.....	
31,480	10,000	.0052	.0007	
34,628	11,000	.0058	.....	
37,776	12,000	.0066	.....	
40,924	13,000	.0073	.....	
44,072	14,000	.0080	.....	
47,220	15,000	.0087	.0016	
50,368	16,000	.0095	.....	
53,516	17,000	.0103	.....	
56,664	18,000	.0111	.....	
59,812	19,000	.0120	.....	
62,960	20,000	.0129	.0031	
66,108	21,000	.0139	.....	
69,256	22,000	.0150	.....	
72,404	23,000	.0160	.....	
75,552	24,000	.0171	.....	
78,700	25,000	.0184	.0059	
81,848	26,000	.0197	.....	
84,996	27,000	.0208	.....	
88,144	28,000	.0225	.....	
91,292	29,000	.0241	.....	
94,440	30,000	.0260	.0110	
97,588	31,000	.0278	.....	
100,736	32,000	.0293	.....	
103,884	33,000	.0317	.....	
107,032	34,000	.0339	.....	
110,180	35,000	.0365	.0193	
113,328	36,000	.0395	.....	
116,476	37,000	.0427	.....	
119,624	38,000	.0457	.....	
122,772	39,000	.0490	.....	
125,920	40,000	.0542	.0343	
129,068	41,000	.0577	.....	
132,216	42,000	.0615	.....	
135,364	43,000	.0673	.....	
138,512	44,000	.0723	.....	
141,660	45,000	.0774	.0552	
144,808	46,000	.0822	.....	
147,956	47,000	.0877	.....	
151,104	48,000	.0949	.....	
154,252	49,000	.1007	.....	
157,400	50,000	.1096	.0848	
160,548	51,000	.1168	.....	
163,696	52,000	.1259	.....	
166,844	53,000	.1360	.....	
169,992	54,000	.1466	.....	
173,140	55,000	.1570	.1295	Deflection at middle, ″.02.
194,560	61,800	.....	.....	Ultimate strength.

The deflection continued under reduced loads.

The first tension fracture appeared in one head next the neck, and on the compression sides of the bend on the ends of the stem.

Continuing the deflection, the load on the specimen fell to 181,000 pounds total, when fracture suddenly occurred, following the lines indicated by the sketch.



No. 4692.

Diameter, 2″.002.
Sectional area, 3.148 square inches.
Gauged length, 6″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
3,148	1,000	0.	0.	Initial load.
6,296	2,000	.0006	.....	
9,444	3,000	.0011	.....	
12,592	4,000	.0016	.....	
15,740	5,000	.0022	.0004	
18,880	6,000	.0028	.....	
22,036	7,000	.0034	.....	
25,184	8,000	.0041	.....	
28,332	9,000	.0047	.....	
31,480	10,000	.0052	.0010	
34,628	11,000	.0060	.....	
37,776	12,000	.0066	.....	
40,924	13,000	.0073	.....	
44,072	14,000	.0080	.....	
47,220	15,000	.0088	.0018	
50,368	16,000	.0096	.....	
53,516	17,000	.0103	.....	
56,664	18,000	.0111	.....	
59,812	19,000	.0120	.....	
62,960	20,000	.0128	.0032	
66,108	21,000	.0138	.....	
69,256	22,000	.0148	.....	
72,404	23,000	.0158	.....	
75,552	24,000	.0168	.....	
78,700	25,000	.0182	.0058	
81,848	26,000	.0194	.....	
84,996	27,000	.0206	.....	
88,144	28,000	.0220	.....	
91,292	29,000	.0237	.....	
94,440	30,000	.0252	.0104	
97,588	31,000	.0269	.....	
100,736	32,000	.0283	.....	
103,884	33,000	.0306	.....	
107,032	34,000	.0327	.....	
110,180	35,000	.0353	.0180	
113,328	36,000	.0383	.....	
116,476	37,000	.0404	.....	
119,624	38,000	.0436	.....	
122,772	39,000	.0465	.....	
125,920	40,000	.0500	.0304	
129,068	41,000	.0544	.....	
132,216	42,000	.0583	.....	
135,364	43,000	.0620	.....	
138,512	44,000	.0669	.....	
141,660	45,000	.0724	.0503	
144,808	46,000	.0776	.....	
147,956	47,000	.0826	.....	
151,104	48,000	.0881	.....	
154,252	49,000	.0937	.....	
157,400	50,000	.1013	.0767	
160,548	51,000	.1087	.....	
163,696	52,000	.1147	.....	
166,844	53,000	.1240	.....	
169,992	54,000	.1310	.....	
173,140	55,000	.1418	.1144	
201,580	64,030	.....	.....	Ultimate strength.

Middle deflection under the maximum load, ″.12.

No. 4693.

Diameter, 2″.002.
Sectional area, 3.148 square inches.
Gauged length, 6″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
3,148	1,000	0.	0.	Initial load.
6,296	2,000	.0005	.....	
9,444	3,000	.0010	.....	
12,592	4,000	.0015	.....	
15,740	5,000	.0019	.0001	
18,888	6,000	.0024	.....	
22,036	7,000	.0029	.....	
25,184	8,000	.0035	.....	
28,332	9,000	.0040	.....	
31,480	10,000	.0046	.0006	
34,628	11,000	.0050	.....	
37,776	12,000	.0057	.....	
40,924	13,000	.0063	.....	
44,072	14,000	.0070	.....	
47,220	15,000	.0076	.0013	
50,368	16,000	.0082	.....	
53,516	17,000	.0088	.....	
56,664	18,000	.0095	.....	
59,812	19,000	.0101	.....	
62,960	20,000	.0107	.0022	
37,776	12,000	.....	.....	Rested 1 hour under this load.
66,108	21,000	.0115	.....	
69,256	22,000	.0122	.....	
72,404	23,000	.0130	.....	
75,552	24,000	.0137	.....	
78,700	25,000	.0148	.0036	
81,848	26,000	.0157	.....	
84,996	27,000	.0169	.....	
88,144	28,000	.0180	.....	
91,292	29,000	.0192	.....	
94,440	30,000	.0206	.0070	
97,588	31,000	.0222	.....	
100,736	32,000	.0236	.....	
103,884	33,000	.0255	.....	
107,032	34,000	.0272	.....	
110,180	35,000	.0299	.0135	
113,328	36,000	.0322	.....	
116,476	37,000	.0339	.....	
119,624	38,000	.0369	.....	
122,772	39,000	.0396	.....	
125,920	40,000	.0427	.0235	
129,068	41,000	.0459	.....	
132,216	42,000	.0497	.....	
135,364	43,000	.0531	.....	
138,512	44,000	.0569	.....	
141,660	45,000	.0614	.0393	
144,808	46,000	.0655	.....	
147,956	47,000	.0692	.....	
151,104	48,000	.0742	.....	
154,252	49,000	.0785	.....	
157,400	50,000	.0839	.0585	
160,548	51,000	.0885	.....	
163,696	52,000	.0927	.....	
166,844	53,000	.0983	.....	
169,992	54,000	.1038	.....	
173,140	55,000	.1093	.0805	
234,200	74,400	.27	.....	Ultimate strength.

Middle deflection under the maximum load, ″.10.
Opened tension cracks in heads next the necks. No other cracks in sight.

No. 4694.

Diameter, 2″.002.
Sectional area, 3.148 square inches.
Gauged length, 6″.

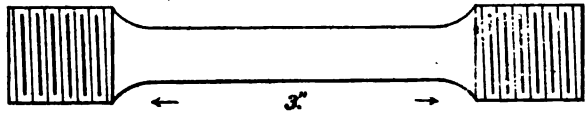
Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
3,148	1,000	0.	0.	Initial load.
6,296	2,000	.0003	.....	
9,444	3,000	.0008	.....	
12,592	4,000	.0012	.....	
15,740	5,000	.0017	0.	
18,880	6,000	.0022	.....	
22,036	7,000	.0027	.....	
25,184	8,000	.0032	.....	
28,332	9,000	.0038	.....	
31,480	10,000	.0043	.0005	
34,628	11,000	.0049	.....	
37,776	12,000	.0055	.....	
40,924	13,000	.0060	.....	
44,072	14,000	.0067	.....	
47,220	15,000	.0072	.0010	
50,368	16,000	.0078	.....	
53,516	17,000	.0085	.....	
56,664	18,000	.0091	.....	
59,812	19,000	.0097	.....	
62,960	20,000	.0103	.0018	
66,108	21,000	.0111	.....	
69,256	22,000	.0118	.....	
72,404	23,000	.0126	.....	
75,552	24,000	.0134	.....	
78,700	25,000	.0142	.0032	
81,848	26,000	.0151	.....	
84,996	27,000	.0161	.....	
88,144	28,000	.0171	.....	
91,292	29,000	.0183	.....	
94,440	30,000	.0195	.0060	
97,588	31,000	.0208	.....	
100,736	32,000	.0220	.....	
103,884	33,000	.0238	.....	
107,032	34,000	.0256	.....	
110,180	35,000	.0273	.0113	
113,328	36,000	.0296	.....	
116,476	37,000	.0320	.....	
119,624	38,000	.0343	.....	
122,772	39,000	.0371	.....	
125,920	40,000	.0402	.0215	
129,068	41,000	.0429	.....	
132,216	42,000	.0463	.....	
135,364	43,000	.0497	.....	
138,512	44,000	.0530	.....	
141,660	45,000	.0572	.0355	
144,808	46,000	.0609	.....	
147,956	47,000	.0649	.....	
151,104	48,000	.0694	.....	
154,252	49,000	.0736	.....	
157,400	50,000	.0790	.0540	
160,548	51,000	.0832	.....	
163,696	52,000	.0875	.....	
166,844	53,000	.0933	.....	
169,992	54,000	.0970	.....	
173,140	55,000	.1040	.0758	
235,400	74,780	.23	.....	Ultimate strength.

Middle deflection under the maximum load, ″.13.
Started a tension fracture near a blow hole in one head.

CAST-IRON FROM WATERTOWN ARSENAL FOUNDRY.

METAL FOR 5-INCH AND 7-INCH SHELL.

Form of specimens.



Specimens of the same number represent castings from the same heat.

Number of test.	Numbers.	Diameter.	Sectional area.	Tensile strength.		Appearance of fracture.
				Total.	Per square inch.	
		Inches.	*Sq. In.*	*Pounds.*	*Pounds.*	
1388	1	.564	.25	6,280	25,120	Granular.
1389	1	.564	.25	6,400	25,600	Do.
1390	1	.564	.25	6,440	25,760	Do.
1391	1	.564	.25	6,380	25,520	Do.
1392	1	.564	.25	6,360	25,440	Do.
1393	Special	1.129	1.00	21,200	21,200	Do.
1394	Cylinder	1.129	1.00	21,550	21,550	Do.
.....	2	.564	.25	8,070	32,280	Do.
.....	2	.564	.25	7,890	31,560	Do.
.....	2	.564	.25	8,030	31,120	Do.

Nos. 1388 and 1391 were from the spongy side of the shell, but were not themselves imperfect in the stem.

Number of test.	Numbers.	Diameter.	Sectional area.	Tensile strength.		Appearance of fracture.
				Total.	Per square inch.	
		Inches.	*Sq. In.*	*Pounds.*	*Pounds.*	
.....	3	.564	.25	5,790	23,160	Granular.
.....	3	.564	.25	5,730	22,920	Do.
.....	3	.564	.25	5,760	23,040	Do.
.....	4	.564	.25	7,830	31,320	Do.
.....	4	.564	.25	7,920	31,680	Do.
.....	4	.564	.25	7,810	31,240	Do.
.....	5	.564	.25	8,250	33,000	Do.
.....	5	.564	.25	8,200	32,800	Do.
.....	5	.564	.25	8,080	32,320	Do.
.....	6	.564	.25	8,630	34,520	Do.
.....	6	.564	.25	7,620	30,480	Granular, broke in thread.
.....	6	.564	.25	8,650	34,600	Granular.
.....	6	.564	.25	8,710	34,840	Do.
.....	6	.564	.25	8,480	33,920	Do.
.....	6	.564	.25	8,640	34,560	Do.
.....	7	.564	.25	9,180	36,720	Do.
.....	7	.564	.25	8,890	35,560	Do.
.....	7	.564	.25	9,220	36,880	Do.

5 AND 7 INCH CORED SHELLS.

Measurements of longitudinal compression and concurrent diametrical extension of two sections each from 5-inch and 7-inch cored shell. Cast at the Watertown Arsenal Foundry.

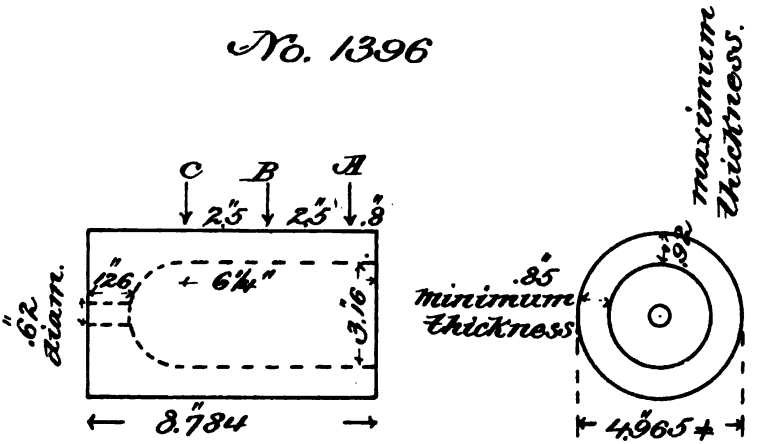
No. 1396.

Diameters measured at planes A, B, and C.
Longitudinal compression measured in a gauged length of 5 inches, from *a* to *c*.
Exterior cylindrical surface and ends dressed. Core in the condition it was cast.
Sectional area (minimum), 11.5 square inches.

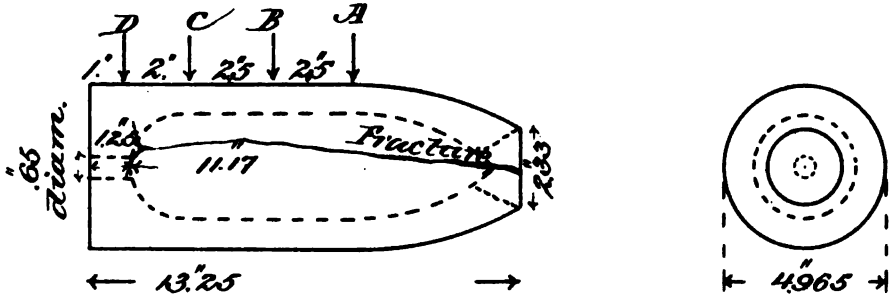
Applied loads.		Longitudinal compression per inch.			Diametrical extension per inch.								
					A.			B.			C.		
Total.	Per square inch.	Compression.	Successive compression.	Permanent set.	Extension.	Successive extension.	Ratio to longitudinal compression.	Extension.	Successive extension.	Ratio to longitudinal compression.	Extension.	Successive extension.	Ratio to longitudinal compression.
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*		*Inch.*	*Inch.*		*Inch.*	*Inch.*	
11,500	1,000	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
57,500	5,000	.000260	.000260		0.	0.		.000020	.000020	13.0	.000081	.000081	3.2
115,000	10,000	.000660	.000400		.000040	.000040	16.5	.000060	.000040	11.0	.000181	.000100	3.6
172,500	15,000	.001000	.000340		.000121	.000081	8.3	.000161	.000101	6.2	.000322	.000141	3.1
11,500	1,000			.000140	.000020		7.0	0.			.000101		1.4
230,000	20,000	.001320	.000320		.000221	.000100	6.0	.000262	.000101	5.0	.000463	.000141	2.9
287,500	25,000	.001660	.000340		.000322	.000101	5.2	.000363	.000101	4.6	.000584	.000121	2.8
345,000	30,000	.002060	.000400		.000403	.000081	5.1	.000524	.000161	3.9	.000745	.000161	2.8
11,500	1,000			.000360	.000060		6.0	.000040		9.0	.000141		2.5
402,500	35,000	.002540	.000480		.000544	.000141	4.7	.000725	.000201	3.5	.000987	.000242	2.6
460,000	40,000	.003180	.000640		.000765	.000221	4.2	.001067	.000342	3.0	.001329	.000342	2.4
517,500	45,000	.004100	.000920		.000967	.000202	4.2	.001470	.000403	2.8	.001762	.000433	2.3
11,500	1,000			.001560	.000383		4.1	.000544		2.9	.000685		2.3
575,000	50,000	.005480	.001380		.001370	.000403	4.0	.002155	.000685	2.5	.002417	.000655	2.3
632,500	55,000	.007340	.001860		.001954	.000584	3.8	.003303	.001148	2.2	.003505	.001088	2.1
690,000	60,000	.009480	.002140		.002659	.000705	3.6	.004552	.001249	2.1	.004773	.001268	2.0
747,500	65,000	.011780	.002300		.003263	.000604	3.6	.006062	.001450	2.0	.006123	.001350	1.9
800,000	69,565	.014180	.002400		.004109	.000846	3.5	.007412	.001410	1.9	.007694	.001571	1.8
11,500	1,000			.007740	.003283		2.4	.005599		1.4	.005700		1.4

5 inch cored Shell.

No. 1396



No. 1397



H Ex 45 50 2

No. 1397.

Diameters measured at planes A, B, C, and D.
Longitudinal compression measured in a gauged length of 5 inches, from *a* to *c*.
Entire exterior surface of shell dressed.
Sectional area, 11.5 square inches.

Applied loads.		Longitudinal compression per inch.			Diametrical extension per inch.											
					A.			B.			C.			D.		
Total.	Per square inch.	Compression.	Successive compression.	Permanent set.	Extension.	Successive extension.	Ratio to longitudinal compression.	Extension.	Successive extension.	Ratio to longitudinal compression.	Extension.	Successive extension	Ratio to longitudinal compression.	Extension.	Successive extension	Ratio to longitudinal compression.
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*		*Inch.*	*Inch.*		*Inch.*	*Inch.*		*Inch.*	*Inch.*	
11,500	1,000	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
57,500	5,000	.000380	.000380	.....	.000081	.000081	4.7	.000060	.000060	6.3	.000081	.000081	4.7	.000040	.000040	9.5
115,000	10,000	.000720	.000340	.....	.000181	.000100	4	.000161	.000101	4.5	.000161	.000080	4.5	.000040	0.	18.0
172,500	15,000	.001040	.000320	.....	.000282	.000101	3.7	.000302	.000142	3.4	.000242	.000081	4.3	.000081	.000041	12.8
11,500	1,000	.....	.....	.000140	.000040	.....	3.5	0.	.....	.....	0.	.....	.....	0.	.....	.....
230,000	20,000	.001360	.000320	.....	.000483	.000201	2.8	.000322	.000020	4.2	.000383	.000141	3.6	.000081	0.	16.8
287,500	25,000	.001720	.000160	.....	.000564	.000081	3	.000483	.000161	3.6	.000483	.000100	3.6	.000101	.000020	17
345,000	30,000	.002120	.000400	.....	.000786	.000222	2.7	.000604	.000121	3.5	.000624	.000141	3.4	.000141	.000040	15
11,500	1,000	.....	.....	.000340	.000141	.....	2.4	.000060	.....	5.8	.000060	.....	5.8	0.	.....	.....
402,500	35,000	.002620	.000600	.....	.001067	.000281	2.5	.000826	.000222	3.2	.000866	.000242	3	.000242	.000101	10.8
460,000	40,000	.003340	.000720	.....	.001551	.000484	2.2	.001027	.000201	3.3	.001148	.000282	2.9	.000322	.000080	10.4
517,500	45,000	.004340	.001000	.....	.002336	.000785	1.9	.001410	.000381	3.1	.001571	.000428	2.8	.000443	.000121	9.8
11,500	1,000	.....	.....	.001680	.001188	.....	1.4	.000584	.....	2.9	.000604	.....	2.8	.000060	.....	28
575,000	50,000	.005900	.001560	.....	.003464	.001128	1.7	.002075	.000665	2.8	.002316	.000745	2.5	.000524	.000081	11.3
632,500	55,000	.008040	.002140	.....	.004995	.001531	1.6	.003021	.000041	2.6	.003323	.001007	2.4	.000765	.000241	10.5
685,000	59,560	Ultimate strength.														

Failed by shearing the truncated point and opening of three longitudinal fractures, extending from the truncated point to the solid section at the base. Total length after fracture, 12″.86.

Shearing stress on cone (area 10″.63) = 64,440 pounds per square inch.

Maximum compressive stress on truncated point of shell, 160,800 pounds per square inch.

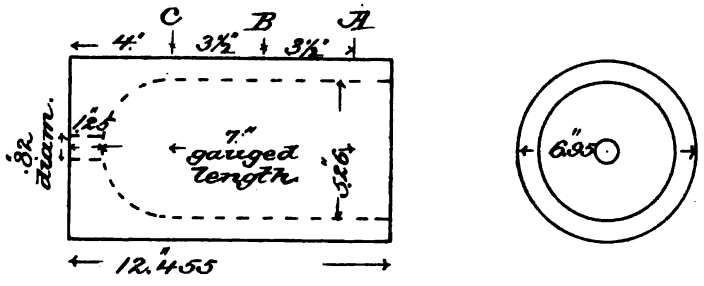
No. 1398.

Diameters measured at planes A, B, and C.
Longitudinal compression measured in a gauged length of 7 inches, from *a* to *c*.
Entire exterior surface of shell dressed.
Sectional area, 16.2 square inches.

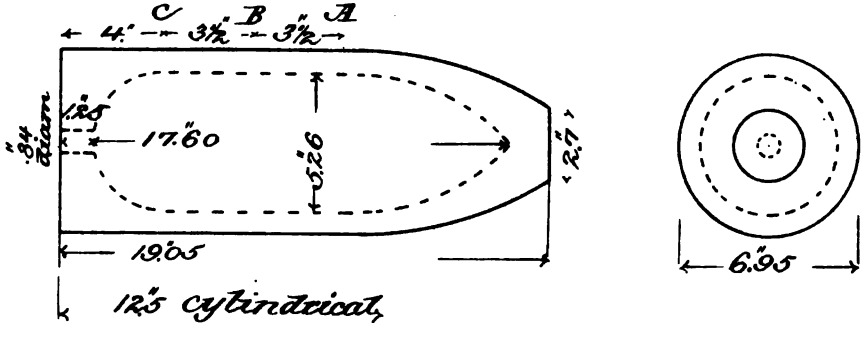
Applied loads.		Longitudinal compression per inch.			Diametrical extension per inch.								
					A.			B.			C.		
Total.	Per square inch.	Compression.	Successive compression.	Permanent set.	Extension.	Successive extension.	Ratio to longitudinal compression.	Extension.	Successive extension.	Ratio to longitudinal compression.	Extension.	Successive extension.	Ratio to longitudinal compression.
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*		*Inch.*	*Inch.*		*Inch.*	*Inch.*	
16,200	1,000	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
81,000	5,000	.000071	.000071		0.	0.	0.	.000043	.000043	1.7	.000115	.000115	0.7
162,000	10,000	.000343	.000272		.000029	.000029	11.8	.000173	.000130	2.0	.000245	.000130	1.4
243,000	15,000	.000629	.000286		.000101	.000072	6.2	.000245	.000072	2.6	.000374	.000129	1.7
16,200	1,000			.000029	0.			0.			.000029		1.0
324,000	20,000	.000914	.000285		.000216	.000115	4.2	.000360	.000115	2.5	.000518	.000144	1.7
405,000	25,000	.001271	.000357		.000317	.000101	4.0	.000475	.000115	2.7	.000647	.000129	2.0
486,000	30,000	.001657	.000386		.000446	.000129	3.7	.000619	.000144	2.7	.000835	.000188	2.0
16,200	1,000			.000186	.000043		4.3	.000072		2.6	.000115		1.6
567,000	35,000	.002200	.000543		.000590	.000144	3.7	.000777	.000158	2.8	.001094	.000259	2.0
648,000	40,000	.002843	.000643		.000763	.000173	3.7	.001050	.000273	2.7	.001439	.000345	2.0
729,000	45,000	.003757	.000914		.001094	.000331	3.4	.001496	.000446	2.5	.002000	.000561	1.9
16,200	1,000			.001329	.000368		3.4	.000561		2.4	.000791		1.7
800,000	49,383	.004914	.001157		.001540	.000446	3.2	.002058	.000562	2.4	.002619	.000619	1.9
16,200	1,000			.002186	.000748		2.9	.001007		2.2	.001293		1.7

7 inch cored Shell.

No. 1398



No. 1399



H Ex 45 50 2

No. 1399.

Diameters measured at planes A, B, and C.
Longitudinal compression measured in a gauged length of 7 inches, from *a* to *c*.
Entire exterior surface of shell dressed.
Sectional area, 16.2 square inches.

Applied loads.		Longitudinal compression per inch.			Diametrical extension per inch.								
					A.			B.			C.		
Total.	Per square inch.	Compression.	Successive compression.	Permanent set.	Extension.	Successive extension.	Ratio to longitudinal compression.	Extension.	Successive extension.	Ratio to longitudinal compression.	Extension.	Successive extension.	Ratio to longitudinal compression.
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*		*Inch.*	*Inch.*		*Inch.*	*Inch.*	
16,200	1,000	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
81,000	5,000	.000200	.000200		.000072	.000072	2.8	.000058	.000058	3.4	.000101	.000101	2.0
162,000	10,000	.000486	.000286		.000129	.000057	3.8	.000144	.000086	3.4	.000245	.000144	2.0
243,000	15,000	.000786	.000300		.000259	.000130	3.0	.000230	.000086	3.4	.000345	.000100	2.3
16,200	1,000			.000071	0.			0.					
324,000	20,000	.001129	.000343		.000374	.000115	3.0	.000302	.000072	3.7	.000432	.000087	2.6
405,000	25,000	.001429	.000300		.000489	.000115	2.9	.000388	.000086	3.7	.000590	.000158	2.4
486,000	30,000	.001814	.000385		.000619	.000130	2.9	.000504	.000116	3.6	.000748	.000158	2.4
16,200	1,000			.000243	.000043		5.7				.000086		2.8
567,000	35,000	.002329	.000515		.000835	.000216	2.8	.000662	.000158	3.5	.001007	.000259	2.3
648,000	40,000	.002971	.000642		.001194	.000359	2.5	.000921	.000259	3.2	.001367	.000360	2.2
729,000	45,000	.003900	.000929		.001741	.000557	2.2	.001281	.000360	3.0	.001957	.000590	2.0
16,200	1,000			.001314	.000734		1.8	.000446		2.9	.000748		1.8
800,000	49,383	.005086	.001186		.002446	.000705	2.1	.001741	.000460	2.9	.002578	.000619	2.0
16,200	1,000				.001281		1.6	.000820		2.5	.001223		1.7

Maximum compressive stress on truncated point of shell 139,710 pounds per square inch.

RECAPITULATION OF RESULTS.

Five-inch shell—Test No. 1397.

Mean tensile strength of 5 specimens from shell (".564 diameter) 25,487 pounds per square inch.
Area of base, 19.31 square inches.
Area of wall section, 11.5 square inches.
With 29,700 pounds per square inch on base of shell the reduction in windage was 50 per cent.
With 32,700 pounds per square inch on base the windage was reduced to 0".0102, a reduction of 71 per cent.
Ruptured with 35,400 pounds per square inch on base of shell.

Seven-inch shell—Test No. 1399.

Mean tensile strength of 3 specimens from shell (".564 diameter) 31,986 pounds per square inch.
Area of base, 37.94 square inches.
Area of wall section, 11.5 square inches.
With 21,000 pounds per square inch on base (corresponding to 800,000 pounds total applied load) the windage was reduced to 0".0321, a loss of 36 per cent.
With the 5-inch shell the enlargements were greatest at the cross-section A, while with the 7-inch they were greatest at C.

COMPRESSION WITH 50,000 POUNDS PER SQUARE INCH OF TWO PIECES OF MIDVALE STEEL FOR CRUSHER GAUGES.

No. 1425.

Small piece.

Diameter, 1".065; sectional area, .89 square inch.
Length before compression, 1".619; length after compression, 1.619.
Load applied, 44,500 pounds=50,000 pounds per square inch.

No. 1426.

Large piece.

Diameter, 2".005; sectional area, 3.16 square inches.
Length before compression, 2".105; length after compression, 2".105.
Load applied, 158,000 pounds=50,000 pounds per square inch.

COMPRESSION

OF

ANNEALED COPPER CYLINDERS

FOR USE IN

CRUSHER GAUGES.

DESCRIPTION OF FIRST SERIES.

In conformity with instructions, out of a lot of 1,500 copper cylinders, 1,000 were subjected in the testing-machine to an initial compression of 18,000 pounds per square inch, and 400 were subjected to an initial compression of 28,000 pounds per square inch.

The coppers varied in both lengths and diameters in not being round; the mean length was about ".4990 and the mean diameter was regarded as ".2506, which gave a sectional area of .0493 square inch.

The pressures per square inch applied to the coppers were on the basis of this sectional area.

The length of each copper was measured before the application of the load of initial compression, and again after the compression was done.

The loads were gradually increased to the required amount, which was maintained with each a period of fifteen seconds. Under the initial load of 18,000 pounds per square inch, all coppers were rejected which compressed more than ".0175 or less than ".0140; thirty-nine being rejected of which the maximum and minimum limits of compression were ".0185 and ".0129, respectively.

Under the initial load of 28,000 pounds per square inch, all coppers were rejected which compressed more than ".0390 or less than ".0345; thirty-nine of this class were rejected, of which the maximum and minimum limits were ".0425 and ".0305, respectively.

Therefore it will be seen that coppers were accepted in the 18,000 pounds per square inch class which gave the maximum difference in compression of ".0035, which amount corresponds to a pressure of 2,200 pounds per square inch at this place as shown by Table 1, column of corrected sets; while the rejected coppers of the same class gave the maximum difference of ".0056, which is found upon reference to the same table corresponds to a pressure of nearly 3,400 pounds per square inch, *i. e.*, the difference between the compression of the coppers as shown by Table 1 between the loads of 18,000 and 21,400 pounds per square inch.

Likewise coppers of the 28,000 pounds per square inch class were accepted which gave the maximum difference in compression of ".0045, which amount corresponds to a pressure of 2,000 pounds per square inch at this place in the table; while the rejected coppers exhibited the maximum difference of ".0120, corresponding to a pressure of 5,200 pounds per square inch, *i. e.*, the difference found between the loads of 28,000 and 33,000 pounds per square inch.

These figures are thought to indicate the extremes of the errors likely to arise in estimating the pressures from the compression of the coppers so far as may be due to the inequality of the copper in its annealed condition and at its first loading.

In the table which next follows are given the number of pieces of the accepted coppers which were compressed, the amounts set opposite those numbers.

TABLE SHOWING THE NUMBER OF CYLINDERS THAT WERE COMPRESSED THE SAME AMOUNT UNDER INITIAL LOADS OF 18,000 POUNDS AND 28,000 POUNDS PER SQUARE INCH.

Initial load 18,000 pounds per square inch.				Initial load 28,000 pounds per square inch.			
Number.	Compression.	Number.	Compression.	Number.	Compression.	Number.	Compression.
	Inch.		*Inch.*		*Inch.*		*Inch.*
5	.0140	49	.0164	5	.0345	9	.0368
2	.0141	42	.0165	10	.0346	13	.0369
1	.0143	33	.0166	3	.0347	18	.0370
8	.0144	34	.0167	5	.0348	7	.0371
11	.0145	29	.0168	4	.0349	11	.0372
8	.0146	24	.0169	8	.0350	12	.0373
15	.0147	30	.0170	10	.0351	7	.0374
16	.0148	13	.0171	7	.0352	10	.0375
10	.0149	8	.0172	8	.0353	4	.0376
26	.0150	5	.0173	18	.0354	6	.0377
28	.0151	3	.0174	12	.0355	5	.0378
57	.0152	5	.0175	11	.0356	3	.0379
45	.0153	.....	.....	10	.0357	1	.0380
37	.0154	.....	.....	20	.0358	3	.0381
57	.0155	.....	.....	16	.0359	1	.0382
53	.0156	.....	.....	16	.0360	3	.0383
56	.0157	.....	.....	13	.0361	5	.0384
57	.0158	.....	.....	15	.0362	1	.0385
66	.0159	.....	.....	18	.0363	1	.0386
44	.0160	.....	.....	23	.0364	1	.0387
44	.0161	.....	.....	13	.0365	5	.0388
40	.0162	.....	.....	18	.0366	3	.0389
39	.0163	.....	.....	7	.0367	1	.0390

Table 1 contains the record of 10 coppers which were used to establish the mean compression of the cylinders between the initial load of 100 pounds and 18,000 pounds per square inch, and from thence for each increment of 200 pounds per square inch up to 60,000 pounds per square inch.

The figures in this table, columns 1 to 10, inclusive, and the mean compression, give the amount of the compression when the coppers were under stress, while in the columns of corrected sets are given the sets which would be found when the loads were released, assuming a modulus of elasticity for the copper of 17,000,000 pounds, which gave a correction of ".0018 at 60,000 pounds per square inch stress, pro rata for lower loads.

Two additional columns of sets are deduced from the column of total sets for the purpose of showing the sets for the higher loads starting from 18,000 pounds per square inch, and from 28,000 pounds per square inch as the initial points.

The relative compressibility of the individual coppers did not continue strictly the same throughout the tests, but with a tendency towards divergence as the higher loads were reached. Still, the differences in the curves were not very striking, and those coppers which were hardest under 18,000 pounds held very nearly the same positions at 60,000 pounds per square inch compression.

Included in Table 2 are the results with coppers subjected to compression by several methods.

Copper No. 11 was removed from the testing-machine and its length and diameter at the middle measured after each increment of load.

The maximum diameter, after being compressed by loads exceeding the elastic limit, at first is not at the middle of the length of the specimen, but nearer each end, the metal assuming the shape here shown, the diameter at the middle being ".0001 to ".0002 smaller than the maximum.

Steel cylinders are observed to behave in a similar manner; cylinders 2" long by ".798 diameter have shown a difference from ".0010 to ".0020 in diameters. These observations relate to the early part of the permanent compression of the metal; afterward, when lateral flow continues without increase of pressure per square inch of actual sectional area, the middle diameter becomes the maximum diameter.

The test of copper No. 11 required nine hours' time. Its curve of compressibility resembles that of the mean curve for specimens 1 to 10, inclusive, yet with an increasing difference between them as the loads advance. This is shown by the following table compiled from the details of the tests:

Applied loads per square inch.	Corrected total permanent set, Table 1.	Permanent set of copper No. 11.	Difference.
Pounds.	*Inch.*	*Inch.*	*Inch.*
18,000	.0162	.0157	−.0005
22,000	.0231	.0240	+.0009
27,400	.0345	.0369	.0024
32,800	.0467	.0504	.0037
38,200	.0595	.0666	.0071
43,600	.0730	.0806	.0076
49,000	.0868	.0975	.0107
54,400	.1014	.1163	.0149
60,000	.1165	.1338	.0173

Inasmuch as the permanent set of No. 11 was below the mean set at 18,000 pounds per square inch, it would be expected to so remain, or nearly so, throughout the test, and the fact that it did not is attributed to its peculiar treatment, in which the length of time and the release and re application of stresses are the characteristic features, and perhaps the latter is the most important one.

The close approximation of the adjustment of the compression platforms of the testing machine to absolute parallelism makes it improbable that the intensity of the stress was much greater than supposed, due to eccentricity of loading, thereby accounting for the permanent sets being higher than the mean curve shows.

The difference in the two sets at 60,000 pounds per square inch is ".0173, which corresponds to a difference of pressure of 5,200 pounds per square inch, as indicated by the compression of copper No. 11.

The manner in which coppers Nos. 1 to 10 were treated, not being removed from the machine between the commencement and finish of the test of each, and the shorter period of time they were exposed to the stresses, favor the adoption of the curve they displayed as more closely representing the use of the coppers in crusher gauges than the test of No. 11.

The compression of coppers Nos. 12 to 17, inclusive, were measured at less frequent increments of load, less total time being consumed in their tests, as each individual load was allowed to act the usual length of time, 15 seconds, then proceeding to the next higher load.

The curves of these cylinders agree fairly well with the mean curve, thus showing the influence of time within the limits of these tests was not of great importance; that time does have an influence in some cases will, however, be shown later on.

Too much reliance should not be placed upon the results with these coppers, except where pronounced differences are found, for while the number of tests may be ample to establish the true behavior the limited size of specimens is disadvantageous in a general way, and some of the apparent tendencies of these cylinders might be found reversed if more favorable opportunities for observation were afforded.

Coppers Nos. 18 and 19 show the effect of compression loads on cylinders which had been compressed by the initial load of 18,000 pounds, followed by a period of 6 days' rest.

Coppers Nos. 20 and 21 were compressed after the application of the initial load of 28,000 pounds per square inch, followed by periods of rest of 70 hours and 96 hours, respectively.

The effect of the initial loads on that part of the curve of each which immediately follows, is conspicuous in the display of greater rigidity for the higher loads; therefore, within this affected zone of abnormal rigidity, large variations of pressure appear nearer uniform than would be the case if the pressure was received by coppers which yield the normal amount of compression under these loads, assuming the estimate of pressure, in each case, is on the basis of the mean sets of the 10 coppers here tabulated.

It is not clear, however, that the effect of the initial loads extended any considerable distance beyond that initial pressure. The final portions of the curves of these four cylinders were at the time of the tests unaffected, apparently, by the initial loads and subsequent periods of rest.

In regard to the effect of earlier stresses transcending the elastic limit, on the elevation of the elastic limit different materials give different results, and, while the effect of several hours' rest in some steel bars has been nil, a period of several years' rest has elevated the elastic limit of some wrought-iron bars 20 per cent. above the previous loading. Corresponding observations on copper have not yet been made.

Cylinder No. 22 was suddenly shortened by a hammer blow ".0652.

Cylinders Nos. 23 and 24 were first compressed in the testing machine with 18,000 pounds per square inch initial load.

No. 23 was shortened by a hammer blow ".0301 above the amount done by the initial load.

No. 24 was shortened by the initial load ".0180; a hammer blow shortened it the further amount of ".0426; a total of ".0606.

The copper was not acted upon directly by the hammer. It was placed within a hollow cylindrical housing, giving clearance to the copper. A well-fitted piston in the housing directly received the hammer blow and transmitted the shock to the copper.

Tests in the machine immediately followed the hammer blows, with the intervention of only a few minutes of time.

Referring to the column of corrected total sets in table 1, it will be seen that these several compressions correspond to the following pressures:

No. 22, ".0652 total set, 40,600 pounds per square inch pressure; No. 24, ".0605 total set, 38,600 pounds per square inch pressure; No. 23 ".0301 set, above initial load of 18,000 pounds per square inch, 32,600 pounds per square inch pressure.

Loading these coppers in the machine it required, in each case, considerably higher pressures than these to cause additional flow of the metal; for a number of the higher loads only the additional compression belonging to the metal when under stress was displayed.

Sufficient data do not appear to be contained in these tests to explain this behavior. The shapes of the hammered coppers were similar to the gradually compressed ones.

The suggestion presents itself that whereas under the static pressure of the testing machine the friction of flow or viscosity of the metal is gradually overcome, and more nearly the entire effect of the pressure is employed in overcoming the resistance to flow independent of the friction of flow, if the two elements may be considered separately, under the dynamic effect of the hammer blows the viscosity of the metal is an appreciable part of the resistance to movement, and thereby absorbs a part of the effect of the blow, the resistance to flow absorbing the remainder, and that the real magnitude of the hammer blows were greater than indicated by the compression of the coppers.

If this is explanatory it must follow that a definite amount of displacement of the metal is not essential in order to reach a certain elevated state of resistance, upon which point we are without further evidence.

Experiments have been made in which drawn-copper bars were subjected in a cylinder containing water to cubic compression of 90,000 pounds per square inch; the bars so compressed gave substantially the same results when afterwards tested by tension and compression, as did uncompressed specimens of the same metal.

These experiments do not necessarily increase the confusion, because in the cubic compression tests there was only elastic displacement when under pressure, which may be unlike the effect of a pressure causing sudden displacement, and is therefore not an analagous case.

Until further investigation the effect of sudden displacement must remain in a measure unknown. Obviously such data relating to both tensile and compressive stresses, and the effects upon other metals as well as upon copper, are very important.

When, on the other hand, slow and gradual displacement is caused, the full effect of the stress is reached only after the lapse of some time, and, generally speaking, the higher the stress the more prominent becomes this feature, it also seems to be influenced by the ductility of the metal; but if sufficient time is allowed in the test for the metal to exhaust its full elongation or compression, it usually detracts from the effects of the next higher stress, and when the time of sustaining the load has been sufficiently prolonged, in the case of wrought iron, the result is the well-known elevation of the elastic limit, which sometimes reaches several thousand pounds per square inch.

During the compression of copper No. 1 there was an interval of rest of 3 minutes under 22,800 pounds per square inch, and the table shows this caused more than the normal difference in reading between that and the following load.

A copper was loaded with 28,000 pounds per square inch compression with the following results:

Total compression.	Time load was sustained.
Inch.	
.0365	1 second.
.0370	1 minute.
.0372	4 minutes.
.0373	9 minutes.
.0374	49 minutes.

Another copper was loaded with 60,000 pounds per square inch compression with the following results:

Total compression.	Time load was sustained.
Inch.	
.1149	2 seconds.
.1163	1 minute.
.1173	4 minutes.
.1182	9 minutes.

From all of which it appears that the curve representing the effect of stresses between the elastic limit and ultimate strength of the metal may be more or less modified by mechanical treatment, in the most simple case where the forces all act without reversal in one direction.

TABLE NO. 1.

Applied loads.		Total compression.											Corrected sets.		
Total	Per square inch.	1	2	3	4	5	6	7	8	9	10	Mean.	Total.	From 18,000 to 60,000 pounds.	From 28,000 to 60,000 pounds.
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*
100	.....	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	Initial load.		.....
887	18,000	.0167	.0172	.0170	.0148	.0166	.0178	.0173	.0176	.0150	.0168	.01668	.01618	0.	.....
897	18,200	.0170	.0176	.0170	.0151	.0169	.0180	.0173	.0176	.0155	.0169	.01689	.01639	.00021	.....
907	18,400	.0170	.0177	.0171	.0153	.0172	.0181	.0175	.0178	.0159	.0169	.01705	.01655	.00037	.....
917	18,600	.0172	.0178	.0174	.0156	.0176	.0182	.0178	.0180	.0161	.0170	.01727	.01677	.00059	.....
927	18,800	.0175	.0179	.0177	.0159	.0180	.0183	.0182	.0183	.0164	.0171	.01753	.01703	.00085	.....
937	19,000	.0178	.0180	.0184	.0161	.0183	.0184	.0185	.0187	.0167	.0173	.01782	.01732	.00114	.....
947	19,200	.0183	.0183	.0187	.0165	.0187	.0186	.0188	.0192	.0171	.0177	.01819	.01769	.00151	.....
956	19,400	.0187	.0188	.0189	.0170	.0190	.0192	.0193	.0197	.0175	.0181	.01862	.01812	.00194	.....
966	19,600	.0190	.0191	.0193	.0174	.0192	.0194	.0198	.0200	.0179	.0184	.01895	.01845	.00227	.....
976	19,800	.0194	.0195	.0197	.0177	.0197	.0197	.0201	.0206	.0184	.0189	.01937	.01887	.00269	.....
986	20,000	.0198	.0200	.0200	.0182	.0201	.0200	.0207	.0209	.0188	.0194	.01979	.01929	.00311	.....
995	20,200	.0201	.0204	.0204	.0185	.0208	.0204	.0210	.0212	.0191	.0197	.02016	.01966	.00348	.....
1,005	20,400	.0202	.0206	.0210	.0192	.0210	.0210	.0215	.0214	.0199	.0199	.02059	.02009	.00391	.....
1,015	20,600	.0208	.0210	.0214	.0195	.0214	.0216	.0220	.0219	.0202	.0202	.02100	.02050	.00432	.....
1,025	20,800	.0212	.0213	.0218	.0197	.0217	.0219	.0222	.0223	.0205	.0206	.02132	.02082	.00464	.....
1,035	21,000	.0217	.0218	.0222	.0200	.0221	.0222	.0227	.0227	.0208	.0209	.02171	.02121	.00503	.....
1,044	21,200	.0220	.0221	.0225	.0205	.0226	.0227	.0232	.0232	.0209	.0214	.02211	.02151	.00533	.....
1,054	21,400	.0224	.0225	.0228	.0209	.0228	.0232	.0237	.0236	.0215	.0219	.02253	.02193	.00575	.....
1,064	21,600	.0230	.0230	.0232	.0212	.0233	.0236	.0240	.0240	.0219	.0224	.02296	.02236	.00618	.....
1,074	21,800	.0233	.0235	.0237	.0215	.0238	.0239	.0243	.0245	.0222	.0228	.02335	.02275	.00657	.....
1,084	22,000	.0237	.0238	.0240	.0220	.0241	.0243	.0247	.0249	.0226	.0231	.02372	.02312	.00694	.....
1,094	22,200	.0242	.0243	.0245	.0224	.0243	.0246	.0250	.0253	.0230	.0236	.02412	.02352	.00734	.....
1,103	22,400	.0247	.0247	.0248	.0229	.0246	.0250	.0256	.0257	.0234	.0241	.02455	.02395	.00777	.....
1,113	22,600	.0251	.0251	.0252	.0231	.0251	.0253	.0260	.0262	.0238	.0246	.02495	.02435	.00817	.....
1,123	22,800	.0255	.0255	.0257	.0235	.0257	.0257	.0265	.0266	.0242	.0250	.02539	.02479	.00861	.....
1,133	23,000	.0266	.0259	.0262	.0237	.0262	.0261	.0268	.0270	.0246	.0253	.02584	.02524	.00906	.....
1,143	23,200	.0270	.0262	.0265	.0241	.0266	.0265	.0272	.0273	.0251	.0256	.02621	.02561	.00943	.....
1,153	23,400	.0273	.0266	.0268	.0245	.0270	.0270	.0276	.0277	.0256	.0261	.02662	.02602	.00984	.....
1,163	23,600	.0277	.0272	.0272	.0250	.0273	.0275	.0280	.0281	.0261	.0265	.02700	.02646	.01028	.....
1,173	23,800	.0280	.0276	.0278	.0255	.0278	.0279	.0284	.0285	.0265	.0269	.02749	.02689	.01071	.....
1,183	24,000	.0284	.0280	.0282	.0259	.0281	.0282	.0289	.0289	.0268	.0273	.02787	.02727	.01109	.....
1,193	24,200	.0288	.0283	.0287	.0264	.0286	.0286	.0293	.0292	.0274	.0277	.02830	.02770	.01152	.....
1,203	24,400	.0294	.0288	.0291	.0270	.0291	.0292	.0298	.0298	.0280	.0281	.02883	.02813	.01195	.....
1,212	24,600	.0298	.0293	.0295	.0274	.0296	.0296	.0303	.0303	.0283	.0285	.02926	.02856	.01238	.....
1,222	24,800	.0302	.0297	.0299	.0277	.0300	.0299	.0307	.0306	.0286	.0288	.02961	.02891	.01273	.....
1,232	25,000	.0305	.0302	.0305	.0283	.0305	.0303	.0311	.0310	.0290	.0293	.03007	.02937	.01319	.....
1,242	25,200	.0309	.0305	.0308	.0287	.0310	.0308	.0315	.0315	.0294	.0297	.03048	.02978	.01360	.....

TABLE NO. 1—Continued.

Applied loads.		Total compression.											Corrected sets.		
Total.	Per square inch.	1	2	3	4	5	6	7	8	9	10	Mean.	Total.	From 18,000 to 60,000 pounds.	From 28,000 to 60,000 pounds.
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*
1,252	25,400	.0313	.0310	.0312	.0293	.0312	.0312	.0320	.0319	.0298	.0301	.03090	.03020	.01402	.....
1,262	25,600	.0317	.0315	.0317	.0297	.0318	.0317	.0323	.0324	.0301	.0306	.03135	.03065	.01447	.....
1,272	25,800	.0322	.0319	.0322	.0300	.0322	.0321	.0329	.0329	.0305	.0310	.03179	.03109	.01491	.....
1,282	26,000	.0325	.0326	.0327	.0303	.0325	.0325	.0335	.0333	.0311	.0314	.03224	.03154	.01536	.....
1,291	26,200	.0330	.0329	.0331	.0307	.0330	.0330	.0339	.0337	.0316	.0319	.03268	.03198	.01580	.....
1,301	26,400	.0335	.0333	.0334	.0311	.0333	.0335	.0342	.0342	.0322	.0324	.03311	.03241	.01623	.....
1,311	26,600	.0340	.0337	.0337	.0315	.0337	.0339	.0345	.0347	.0325	.0327	.03349	.03279	.01661	.....
1,321	26,800	.0346	.0340	.0342	.0320	.0342	.0343	.0351	.0351	.0329	.0332	.03396	.03326	.01708	.....
1,331	27,000	.0351	.0343	.0347	.0325	.0347	.0348	.0355	.0354	.0334	.0335	.03439	.03369	.01741	.....
1,341	27,200	.0355	.0347	.0351	.0329	.0351	.0352	.0359	.0362	.0339	.0340	.03485	.03405	.01787	.....
1,351	27,400	.0359	.0352	.0356	.0334	.0356	.0356	.0362	.0367	.0342	.0346	.03530	.03450	.01832	.....
1,361	27,600	.0362	.0356	.0358	.0338	.0361	.0359	.0367	.0370	.0347	.0349	.03567	.03487	.01869	.....
1,371	27,800	.0366	.0362	.0363	.0341	.0363	.0363	.0372	.0375	.0353	.0353	.03611	.03531	.01913	.....
1,381	28,000	.0370	.0367	.0368	.0346	.0367	.0367	.0377	.0379	.0357	.0357	.03655	.03575	.01957	0.
1,391	28,200	.0375	.0370	.0374	.0349	.0373	.0375	.0382	.0382	.0361	.0360	.03701	.03621	.02003	.00046
1,401	28,400	.0381	.0377	.0381	.0355	.0378	.0381	.0387	.0385	.0365	.0365	.03755	.03675	.02057	.00100
1,411	28,600	.0386	.0381	.0386	.0360	.0382	.0385	.0394	.0391	.0370	.0370	.03805	.03725	.02107	.00150
1,421	28,800	.0390	.0384	.0390	.0365	.0385	.0388	.0400	.0398	.0375	.0375	.03850	.03770	.02152	.00195
1,430	29,000	.0395	.0389	.0393	.0370	.0389	.0391	.0404	.0402	.0378	.0380	.03891	.03810	.02192	.00235
1,440	29,200	.0399	.0393	.0396	.0375	.0393	.0395	.0407	.0406	.0382	.0384	.03930	.03850	.02232	.00275
1,450	29,400	.0403	.0398	.0398	.0380	.0397	.0400	.0411	.0410	.0386	.0387	.03970	.03890	.02272	.00315
1,460	29,600	.0408	.0404	.0402	.0382	.0404	.0405	.0415	.0414	.0390	.0392	.04016	.03936	.02318	.00361
1,470	29,800	.0414	.0409	.0406	.0387	.0409	.0410	.0421	.0419	.0395	.0398	.04068	.03978	.02360	.00403
1,480	30,000	.0418	.0413	.0413	.0390	.0413	.0415	.0425	.0424	.0400	.0402	.04118	.04023	.02405	.00448
1,490	30,200	.0423	.0416	.0417	.0395	.0417	.0419	.0430	.0429	.0405	.0407	.04158	.04068	.02450	.00493
1,499	30,400	.0427	.0420	.0420	.0399	.0423	.0424	.0434	.0435	.0408	.0410	.04200	.04120	.02502	.00545
1,509	30,600	.0434	.0424	.0428	.0404	.0428	.0430	.0440	.0439	.0413	.0415	.04255	.04175	.02557	.00600
1,519	30,800	.0437	.0429	.0431	.0408	.0432	.0432	.0445	.0441	.0418	.0420	.04293	.04203	.02585	.00628
1,529	31,000	.0441	.0434	.0435	.0412	.0438	.0437	.0449	.0446	.0420	.0425	.04337	.04247	.02629	.00672
1,539	31,200	.0446	.0437	.0438	.0416	.0443	.0443	.0453	.0450	.0426	.0427	.04379	.04289	.02671	.00714
1,549	31,400	.0450	.0442	.0442	.0420	.0448	.0447	.0457	.0455	.0431	.0430	.04422	.04332	.02714	.00757
1,559	31,600	.0455	.0445	.0450	.0425	.0452	.0452	.0462	.0460	.0437	.0432	.04470	.04380	.02762	.00805
1,568	31,800	.0460	.0450	.0455	.0430	.0457	.0457	.0467	.0463	.0443	.0435	.04517	.04427	.02809	.00852
1,578	32,000	.0465	.0455	.0461	.0435	.0461	.0461	.0472	.0469	.0448	.0438	.04565	.04475	.02857	.00900
1,588	32,200	.0470	.0461	.0467	.0441	.0466	.0465	.0476	.0475	.0451	.0442	.04614	.04524	.02906	.00949
1,598	32,400	.0474	.0466	.0472	.0447	.0470	.0470	.0481	.0479	.0455	.0448	.04662	.04572	.02954	.00997
1,608	32,600	.0480	.0471	.0477	.0451	.0477	.0474	.0486	.0485	.0462	.0457	.04720	.04630	.03012	.01055
[illegible]	[illegible]	.0485	.0474	.0481	.0455	.0185	.0479	.0491	.0490	.0465	.0462	.04767	.04670	.03052	.01095
			.0480	.0483	.0461	.0488	.0484	.0496	.0494	.0470	.0468	.04814	.04724	.03106	.01149

1,638	33,200	.0495	.0485	.0487	.0465	.0491	.0489	.0501	.0498	.0475	.0474	.04860	.04770	.03152	.01195
1,647	33,400	.0500	.0490	.0491	.0470	.0494	.0493	.0505	.0503	.0479	.0480	.04905	.04815	.03197	.01240
1,657	33,600	.0505	.0495	.0497	.0475	.0498	.0497	.0510	.0508	.0483	.0487	.04955	.04865	.03247	.01290
1,667	33,800	.0510	.0500	.0500	.0481	.0500	.0501	.0513	.0513	.0489	.0491	.04998	.04908	.03290	.01333
1,677	34,000	.0514	.0505	.0506	.0485	.0503	.0505	.0519	.0517	.0493	.0494	.05041	.04941	.03323	.01366
1,686	34,200	.0518	.0510	.0511	.0488	.0506	.0510	.0527	.0520	.0499	.0498	.05087	.04987	.03369	.01412
1,696	34,400	.0522	.0514	.0514	.0490	.0512	.0515	.0530	.0525	.0502	.0503	.05127	.05027	.03409	.01452
1,706	34,600	.0528	.0519	.0518	.0495	.0517	.0522	.0532	.0532	.0509	.0507	.05179	.05079	.03461	.01504
1,716	34,800	.0533	.0522	.0524	.0505	.0523	.0525	.0536	.0538	.0512	.0512	.05230	.05130	.03512	.01555
1,726	35,000	.0539	.0528	.0529	.0510	.0528	.0531	.0539	.0541	.0516	.0515	.05276	.05176	.03558	.01601
1,735	35,200	.0545	.0535	.0533	.0513	.0535	.0535	.0545	.0546	.0521	.0520	.05328	.05228	.03610	.01653
1,745	35,400	.0548	.0538	.0538	.0516	.0540	.0538	.0549	.0552	.0526	.0526	.05371	.05271	.03653	.01696
1,755	35,600	.0552	.0545	.0546	.0519	.0546	.0543	.0554	.0557	.0531	.0531	.05424	.05324	.03706	.01749
1,765	35,800	.0559	.0550	.0550	.0523	.0550	.0548	.0560	.0562	.0535	.0536	.05473	.05373	.03755	.01798
1,774	36,000	.0563	.0555	.0554	.0531	.0554	.0553	.0563	.0565	.0540	.0541	.05519	.05419	.03801	.01844
1,784	36,200	.0567	.0559	.0560	.0537	.0559	.0557	.0569	.0568	.0545	.0545	.05568	.05468	.03848	.01891
1,794	36,400	.0572	.0564	.0565	.0540	.0563	.0562	.0575	.0572	.0550	.0552	.05615	.05515	.03897	.01940
1,804	36,600	.0577	.0568	.0570	.0544	.0569	.0568	.0580	.0580	.0556	.0558	.05670	.05570	.03952	.01995
1,814	36,800	.0582	.0572	.0575	.0550	.0573	.0575	.0585	.0586	.0561	.0562	.05721	.05621	.04003	.02046
1,824	37,000	.0587	.0578	.0579	.0556	.0578	.0580	.0590	.0590	.0566	.0565	.05769	.05669	.04051	.02094
1,833	37,200	.0592	.0583	.0582	.0559	.0584	.0582	.0593	.0595	.0570	.0570	.05810	.05710	.04092	.02135
1,843	37,400	.0597	.0586	.0586	.0561	.0588	.0589	.0597	.0598	.9574	.0576	.05852	.05752	.04134	.02177
1,853	37,600	.0602	.0591	.0590	.0565	.0592	.0594	.0602	.0604	.0581	.0581	.05902	.05802	.04184	.02227
1,863	37,800	.0608	.0596	.0595	.0568	.0599	.0597	.0607	.0609	.0586	.0586	.05951	.05851	.04233	.02276
1,873	38,000	.0615	.0602	.0600	.0574	.0605	.0602	.0612	.0614	.0590	.0590	.06004	.05904	.04286	.02329
1,883	38,200	.0620	.0606	.0607	.0583	.0612	.0607	.0618	.0620	.0594	.0594	.06061	.05951	.04333	.02376
1,892	38,400	.0625	.0610	.0612	.0588	.0617	.0610	.0622	.0625	.0597	.0600	.06106	.05996	.04378	.02421
1,902	38,600	.0629	.0614	.0619	.0591	.0621	.0617	.0629	.0630	.0603	.0607	.06160	.06050	.04432	.02475
1,912	38,800	.0634	.0620	.0624	.0596	.0624	.0621	.0635	.0634	.0608	.0613	.06209	.06099	.04481	.02524
1,922	39,000	.0639	.0625	.0629	.0601	.0628	.0626	.0638	.0640	.0611	.0616	.06253	.06143	.04525	.02568
1,932	39,200	.0646	.0631	.0632	.0604	.0631	.0631	.0641	.0644	.0616	.0620	.06296	.06186	.04568	.02611
1,942	39,400	.0652	.0635	.0636	.0608	.0636	.0636	.0645	.0650	.0621	.0625	.06344	.06234	.04616	.02659
1,952	39,600	.0656	.0640	.0640	.0612	.0639	.0640	.0650	.0655	.0627	.0630	.06389	.06279	.04661	.02704
1,962	39,800	.0659	.0645	.0642	.0617	.0647	.0644	.0657	.0658	.0631	.0635	.06435	.06325	.04707	.02750
1,972	40,000	.0664	.0650	.0647	.0623	.0653	.0648	.0662	.0662	.0637	.0640	.06486	.06376	.04758	.02801
1,981	40,200	.0668	.0655	.0649	.0627	.0660	.0646	.0669	.0669	.0641	.0645	.06529	.06419	.04801	.02844
1,991	40,400	.0672	.0659	.0653	.0633	.0662	.0662	.0673	.0675	.0647	.0650	.06586	.06476	.04858	.02901
2,001	40,600	.0678	.0663	.0656	.0642	.0667	.0666	.0676	.0682	.0653	.0656	.06639	.06529	.04911	.02954
2,011	40,800	.0683	.0668	.0660	.0646	.0671	.0670	.0678	.0687	.0660	.0660	.06683	.06573	.04955	.02998
2,021	41,000	.0688	.0674	.0663	.0653	.0675	.0675	.0682	.0690	.0664	.0664	.06728	.06618	.05000	.03043
2,031	41,200	.0693	.0678	.0670	.0658	.0678	.0680	.0686	.0695	.0669	.0668	.06775	.06665	.05047	.03090
2,041	41,400	.0699	.0682	.0682	.0664	.0682	.0685	.0692	.0698	.0672	.0673	.06829	.06719	.05101	.03144
2,051	41,600	.0705	.0686	.0687	.0668	.0685	.0690	.0699	.0705	.0679	.0680	.06884	.06774	.05156	.03199
2,061	41,800	.0710	.0693	.0692	.0670	.0688	.0695	.0704	.0711	.0685	.0685	.06933	.06823	.05205	.03248
2,071	42,000	.0715	.0698	.0703	.0673	.0694	.0702	.0708	.0716	.0688	.0690	.06986	.06876	.05258	.03301
2,080	42,200	.0720	.0702	.0707	.0677	.0698	.0707	.0713	.0722	.0691	.0695	.07062	.06922	.05304	.03347
2,090	42,400	.0725	.0707	.0710	.0681	.0701	.0713	.0717	.0727	.0695	.0699	.07075	.06965	.05347	.03390
2,100	42,600	.0730	.0713	.0715	.0687	.0709	.0719	.0723	.0732	.0700	.0704	.07132	.07022	.05401	.03447
2,110	42,800	.0736	.0720	.0720	.0693	.0719	.0725	.0728	.0738	.0704	.0710	.07193	.07083	.05465	.03508
2,120	43,000	.0745	.0725	.0729	.0699	.0726	.0730	.0735	.0743	.0712	.0715	.07259	.07149	.05581	.03574
2,130	43,200	.0750	.0730	.0734	.0704	.0731	.0735	.0740	.0748	.0719	.0718	.07309	.07199	.05581	.03624
2,139	43,400	.0754	.0736	.0743	.0710	.0735	.0739	.0743	.0755	.0725	.0724	.07364	.07254	.05636	.03679

TABLE No. 1—Continued.

Applied loads.		Total compression.											Corrected sets.		
Total.	Per square inch.	1	2	3	4	5	6	7	8	9	10	Mean.	Total.	From 18,000 to 60,000 pounds.	From 28,000 to 60,000 pounds.
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*
2,149	43,600	.0759	.0742	.0745	.0714	.0737	.0745	.0748	.0760	.0729	.0728	.07407	.07297	.05679	.03722
2,159	43,800	.0762	.0747	.0749	.0722	.0740	.0749	.0753	.0762	.0735	.0734	.07453	.07323	.05705	.03748
2,169	44,000	.0766	.0752	.0752	.0724	.0743	.0753	.0762	.0765	.0739	.0739	.07495	.07375	.05757	.03800
2,179	44,200	.0771	0757	.0757	.0727	.0755	.0758	.0766	.0772	.0742	.0743	.07548	.07428	.05800	.03843
2,189	44,400	.0775	.0762	.0761	.0734	.0762	.0764	.0771	.0779	.0746	.0750	.07604	.07484	.05866	.03909
2,199	44,600	.0783	.0766	.0766	.0737	.0767	.0769	.0776	.0785	.0752	.0755	.07656	.07536	.05918	.03961
2,208	44,800	.0789	.0770	.0773	.0742	.0773	.0776	.0779	.0790	.0759	.0760	.07711	.07591	.05973	.04016
2,218	45,000	.0795	.0777	.0777	.0750	.0778	.0780	.0785	.0793	.0765	.0765	.07765	.07645	.06027	.04070
2,228	45,200	.0800	.0782	.0783	.0753	.0781	.0783	.0791	.0798	.0770	.0770	.07811	.07691	.06073	.04116
2,238	45,400	.0804	.0786	.0787	.0757	.0787	.0788	.0796	.0806	.0773	.0776	.07860	.07740	.06122	.04165
2,248	45,600	.0809	.0788	.0790	.0760	.0790	.0795	.0802	.0810	.0779	.0782	.07905	.07775	.06157	.04200
2,258	45,800	.0815	.0795	.0796	.0766	.0795	.0801	.0807	.0815	.0786	.0789	.07965	.07835	.06217	.04260
2,268	46,000	.0820	.0805	.0801	.0772	.0800	.0807	.0812	.0820	.0792	.0794	.08023	.07893	.06275	.04318
2,278	46,200	.0825	.0811	.0809	.0780	.0807	.0813	.0817	.0825	.0797	.0798	.08082	.07952	.06334	.04377
2,287	46,400	.0830	.0818	.0814	.0787	.0812	.0818	.0822	.0832	.0801	.0803	.08137	.08007	.06389	.04432
2,297	46,600	.0833	.0825	.0818	.0794	.0818	.0822	.0828	.0838	.0805	.0808	.08189	.08059	.06441	.04484
2,307	46,800	.0840	.0830	.0822	.0798	.0822	.0830	.0834	.0846	.0810	.0815	.08247	.08117	.06499	.04542
2,317	47,000	.0846	.0834	.0826	.0803	.0827	.0833	.0840	.0850	.0815	.0819	.08293	.08163	.06545	.04588
2,327	47,200	.0850	.0837	.0835	.0808	.0830	.0838	.0845	.0855	.0823	.0822	.08343	.08213	.06595	.04638
2,337	47,400	.0860	.0839	.0838	.0812	.0837	.0841	.0850	.0858	.0831	.0827	.08393	.08263	.06645	.04688
2,346	47,600	.0863	.0842	.0842	.0819	.0845	.0847	.0855	.0861	.0836	.0835	.08445	.08315	.06697	.04740
2,356	47,800	.0867	.0846	.0845	.0821	.0849	.0854	.0862	.0868	.0840	.0839	.08491	.08361	.06743	.04786
2,366	48,000	.0872	.0852	.0850	.0824	.0858	.0858	.0867	.0875	.0844	.0842	.08542	.08412	.06794	.04837
2,376	48,200	.0879	.0858	.0857	.0828	.0863	.0864	.0870	.0880	.0849	.0347	.08505	.08455	.06837	.04880
2,386	48,400	.0884	.0863	.0864	.0832	.0869	.0870	.0875	.0885	.0854	.0854	.08650	.08510	.06892	.04935
2,396	48,600	.0891	.0867	.0871	.0840	.0877	.0877	.0880	.0888	.0860	.0858	.08709	.08569	.06951	.04994
2,406	48,800	.0898	.0872	.0877	.0844	.0881	.0883	.0886	.0894	.0866	.0862	.08763	.08623	.07005	.05048
2,416	49,000	.0905	.0878	.0883	.0848	.0885	.0890	.0892	.0901	.0870	.0870	.08822	.08682	.07064	.05107
2,426	49,200	.0910	.0883	.0888	.0852	.0893	.0894	.0897	.0908	.0875	.0874	.08874	.08734	.07116	.05159
2,436	49,400	.0915	.0891	.0895	.0857	.0899	.0899	.0902	.0913	.0880	.0877	.08928	.08788	.07170	.05213
2,445	49,600	.0922	.0898	.0900	.0863	.0904	.0906	.0907	.0916	.0886	.0881	.08983	.08843	.07225	.05268
2,455	49,800	.0927	.0902	.0908	.0870	.0910	.0912	.0915	.0920	.0891	.0889	.09044	.08904	.07286	.05329
2,465	50,000	.0931	.0905	.0913	.0874	.0913	.0916	.0920	.0927	.0898	.0893	.09090	.08950	.07332	.05375
2,475	50,200	.0936	.0910	.0920	.0882	.0915	.0919	.0924	.0935	.0902	.0898	.09141	.09001	.07383	.05426
2,485	50,400	.0941	.0915	.0924	.0889	.0917	.0922	.0929	.0940	.0906	.0903	.09186	.09046	.07428	.05471
2,495	50,600	.0947	.0921	.0927	.0894	.0922	.0930	.0934	.0945	.0909	.0909	.09238	.09098	.07480	.05523
2,504	50,800	.0953	.0930	.0930	.0902	.0929	.0935	.0943	.0952	.0914	.0916	.09304	.09154	.07536	.05579
2,514	51,000	.0958	.0939	.0934	.0907	.0933	.0944	.0948	.0951	.0920	.0922	.09359	.09209	.07591	.05634
		.0964	.0943	.0937	.0914	.0937	.0956	.0951	.0961	.0925	.0928	.09416	.09266	.07648	.05691

2,534	51,400	.0960	.0948	.0949	.0918	.0944	.0958	.0957	.0967	.0933	.0933	.09476	.09326	.07708	.05751
2,544	51,600	.0973	.0952	.0956	.0921	.0951	.0961	.0962	.0972	.0937	.0940	.09525	.09375	.07757	.05800
2,554	51,800	.0978	.0957	.0962	.0924	.0955	.0965	.0966	.0978	.0944	.0945	.09574	.09424	.07806	.05849
2,564	52,000	.0985	.0962	.0967	.0926	.0961	.0970	.0970	.0985	.0949	.0950	.09625	.09475	.07857	.05900
2,573	52,200	.0990	.0968	.0972	.0931	.0965	.0975	.0976	.0988	.0953	.0954	.09672	.09522	.07904	.05947
2,583	52,400	.0996	.0971	.0977	.0938	.0970	.0979	.0982	.0995	.0958	.0958	.09724	.09574	.07956	.05999
2,593	52,600	.1001	.0976	.0985	.0943	.0977	.0985	.0988	.1001	.0965	.0965	.09786	.09636	.08018	.06061
2,603	52,800	.1006	.0980	.0993	.0954	.0985	.0990	.0993	.1010	.0973	.0969	.09853	.09703	.08085	.06128
2,613	53,000	.1010	.0986	.0998	.0960	.0990	.0995	.0998	.1015	.0979	.0972	.09903	.09753	.08135	.06178
2,623	53,200	.1017	.0991	.1002	.0965	.0995	.0999	.1003	.1019	.0982	.0977	.09950	.09800	.08182	.06225
2,632	53,400	.1022	.1002	.1007	.0972	.1002	.1009	.1010	.1024	.0988	.0985	.10021	.09871	.08253	.06296
2,642	53,600	.1026	.1009	.1013	.0974	.1012	.1018	.1017	.1029	.0993	.0994	.10085	.09935	.08317	.06360
2,652	53,800	.1033	.1015	.1020	.0976	.1018	.1023	.1023	.1035	.0998	.0999	.10140	.09990	.08372	.06415
2,662	54,000	.1039	.1022	.1025	.0981	.1024	.1030	.1028	.1040	.1005	.1002	.10196	.10046	.08428	.06471
2,672	54,200	.1045	.1026	.1028	.0989	.1031	.1036	.1032	.1044	.1011	.1006	.10248	.10098	.08480	.06523
2,682	54,400	.1053	.1030	.1033	.0993	.1038	.1040	.1040	.1050	.1015	.1011	.10303	.10143	.08525	.06568
2,692	54,600	.1058	.1034	.1040	.0999	.1042	.1043	.1045	.1056	.1021	.1016	.10354	.10194	.08576	.06619
2,702	54,800	.1063	.1040	.1046	.1002	.1045	.1050	.1052	.1062	.1027	.1021	.10408	.10248	.08630	.06673
2,712	55,000	.1071	.1048	.1050	.1009	.1051	.1056	.1055	.1068	.1034	.1029	.10471	.10311	.08693	.06736
2,721	55,200	.1075	.1052	.1057	.1013	.1055	.1060	.1057	.1072	.1039	.1035	.10515	.10355	.08737	.06780
2,731	55,400	.1080	.1057	.1062	.1018	.1060	.1065	.1062	.1078	.1044	.1040	.10566	.10406	.08788	.06831
2,741	55,600	.1084	.1061	.1067	.1025	.1064	.1070	.1066	.1084	.1049	.1045	.10615	.10455	.08837	.06880
2,751	55,800	.1088	.1065	.1072	.1030	.1068	.1074	.1072	.1093	.1057	.1050	.10669	.10509	.08891	.06934
2,761	56,000	.1097	.1069	.1078	.1037	.1071	.1079	.1081	.1100	.1066	.1055	.10733	.10573	.08955	.06998
2,771	56,200	.1102	.1073	.1085	.1044	.1076	.1084	.1087	.1105	.1070	.1063	.10789	.10629	.09011	.07054
2,780	56,400	.1107	.1079	.1092	.1048	.1080	.1090	.1091	.1110	.1074	.1070	.10841	.10681	.09063	.07106
2,790	56,600	.1111	.1083	.1097	.1051	.1084	.1100	.1098	.1115	.1078	.1075	.10892	.10732	.09114	.07157
2,800	56,800	.1116	.1087	.1101	.1057	.1089	.1106	.1102	.1119	.1085	.1079	.10941	.10781	.09163	.07206
2,810	57,000	.1121	.1093	.1105	.1065	.1095	.1110	.1110	.1123	.1091	.1087	.11000	.10840	.09222	.07265
2,820	57,200	.1127	.1100	.1111	.1070	.1101	.1115	.1114	.1130	.1096	.1091	.11055	.10885	.09267	.07310
2,830	57,400	.1133	.1104	.1116	.1073	.1111	.1119	.1119	.1135	.1100	.1096	.11106	.10936	.09318	.07361
2,840	57,600	.1137	.1111	.1119	.1079	.1119	.1124	.1122	.1140	.1105	.1101	.11157	.10987	.09369	.07412
2,849	57,800	.1146	.1117	.1123	.1084	.1121	.1129	.1127	.1146	.1112	.1106	.11211	.11041	.09423	.07466
2,859	58,000	.1151	.1122	.1128	.1089	.1124	.1135	.1133	.1150	.1116	.1112	.11260	.11090	.09472	.07515
2,869	58,200	.1158	.1130	.1135	.1098	.1127	.1143	.1137	.1155	.1120	.1120	.11323	.11153	.09535	.07578
2,879	58,400	.1168	.1137	.1140	.1103	.1132	.1149	.1146	.1162	.1124	.1124	.11385	.11215	.09597	.07640
2,889	58,600	.1172	.1145	.1147	.1109	.1141	.1154	.1153	.1167	.1128	.1127	.11443	.11273	.09655	.07698
2,899	58,800	.1176	.1153	.1153	.1113	.1152	.1160	.1158	.1173	.1136	.1138	.11512	.11342	.09724	.07767
2,909	59,000	.1180	.1157	.1158	.1118	.1157	.1167	.1163	.1180	.1144	.1144	.11568	.11398	.09780	.07823
2,919	59,200	.1183	.1160	.1162	.1123	.1161	.1173	.1168	.1187	.1150	.1148	.11615	.11445	.09827	.07870
2,928	59,400	.1189	.1165	.1167	.1128	.1167	.1178	.1172	.1193	.1157	.1153	.11671	.11491	.09873	.07916
2,938	59,600	.1194	.1170	.1171	.1135	.1173	.1182	.1176	.1199	.1163	.1156	.11719	.11539	.09921	.07964
2,948	59,800	.1199	.1176	.1181	.1141	.1177	.1188	.1182	.1203	.1168	.1160	.11774	.11594	.09976	.08019
2,958	60,000	.1204	.1180	.1190	.1146	.1180	.1193	.1188	.1209	.1173	.1165	.11828	.11648	.10030	.08073

TABLE No. 2.

Applied loads.		No. 11.			Total compression.													
Total.	Per square inch.	Length.	Permanent set.	Middle diameter.	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*
100	.....	.4992	0.	.2506	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
887	18,000	.4835	.0157	.2553	.0115	.0186	.0180	.0188	.0187	.0173	.0005	.0005	.....	.....	.....	.....	.....	.....
897	18,200	.4829	.0163	.....	.....	.....	.....	.....	.....	.....	.0005	.0006	.....	.....	.....	.....	.....	.....
907	18,400	.4810	.0182	.....	.....	.....	.....	.....	.....	.....	.0006	.0008	.....	.....	.....	.....	.....	.....
917	18,600	.4806	.0186	.....	.....	.....	.....	.....	.....	.....	.0007	.0009	.....	.....	.....	.....	.....	.....
927	18,800	.4804	.0188	.....	.....	.....	.....	.....	.....	.....	.0008	.0013	.....	.....	.....	.....	.....	.....
937	19,000	.4801	.0188+	.2561	.0178	.....	.....	.....	.....	.....	.001υ	.0017	.....	.....	.....	.....	.....	.....
947	19,200	.4801	.0191	.....	.....	.....	.....	.....	.....	.....	.0013	.0021	.....	.....	.....	.....	.....	.....
950	19,400	.4798	.0194	.....	.....	.....	.....	.....	.....	.....	.0023	.0025	.....	.....	.....	.....	.....	.....
966	19,600	.4796	.0196	.....	.....	.....	.....	.....	.....	.....	.0026	.0028	.....	.....	.....	.....	.....	.....
976	19,800	.4796	.0196	.....	.....	.....	.....	.....	.....	.....	.0032	.0034	.....	.....	.....	.....	.....	.....
986	20,000	.4793	.0199	.....	.0197	.0213	.0212	.0222	.0219	.0212	.0037	.0037	.....	.....	.....	.....	.....	.....
995	20,200	.4790	.0202	.....	.....	.....	.....	.....	.....	.....	.0040	.0041	.....	.....	.....	.....	.....	.....
1,005	20,400	.4786	.0206	.....	.....	.....	.....	.....	.....	.....	.0042	.0043	.....	.....	.....	.....	.....	.....
1,015	20,600	.4783	.0209	.....	.....	.....	.....	.....	.....	.....	.0045	.0048	.....	.....	.....	.....	.....	.....
1,025	20,800	.4776	.0216	.....	.....	.....	.....	.....	.....	.....	.0050	.0052	.....	.....	.....	.....	.....	.....
1,035	21,000	.4772	.0220	.2572	.0215	.....	.....	.....	.....	.....	.0053	.0057	.....	.....	.....	.....	.....	.....
1,044	21,200	.4767	.0223	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1,054	21,400	.4764	.0228	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1,064	21,600	.4758	.0234	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1,074	21,800	.4754	.0238	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1,084	22,000	.4752	.0240	.2576	.0237	.....	.....	.....	.....	.....	.0078	.0076	.....	.....	.....	.....	.....	.....
1,094	22,200	.4746	.0246	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1,103	22,400	.4743	.0249	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1,113	22,600	.4737	.0255	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1,123	22,800	.4733	.0259	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1,133	23,000	.4727	.0265	.2583	.0256	.....	.....	.....	.....	.....	.0097	.0101	.....	.....	.....	.....	.....	.....
1,143	23,200	.4724	.0268	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1,153	23,400	.4721	.0271	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1,163	23,600	.4715	.0277	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1,173	23,800	.4710	.0282	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1,183	24,000	.4706	.0286	.2589	.0277	.....	.....	.....	.....	.....	.0119	.0116	.....	.....	.....	.....	.....	.....
1,193	24,200	.4700	.0292	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1,203	24,400	.4694	.0298	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1,212	24,600	.4688	.0304	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1,223	24,800	.4685	.0307	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1,232	25,000	.4679	.0313	.2598	.0293	.0334	.0322	.0335	.0330	.0320	.0141	.0137	.....	.....	.....	.....	.....	.....
1,242	25,200	.4673	.0319	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
			.0323															

1,262	25,600	.4664	.0328																
1,272	25,800	.4660	.0332																
1,282	26,000	.4655	.0337	.2602	.0321							.0160	.0158						
1,291	26,200	.4649	.0343																
1,301	26,400	.4642	.0350																
1,311	26,600	.4637	.0355																
1,321	26,800	.4633	.0359																
1,331	27,000	.4630	.0362	.2610	.0341							.0188	.0180						
1,341	27,200	.4626	.0366																
1,351	27,400	.4623	.0369																
1,361	27,600	.4619	.0373																
1,371	27,800	.4615	.0377																
1,381	28,000	.4609	.0383	.2615	.0375							.0204	.0198	.0008	.0008				
1,391	28,200	.4603	.0389											.0008	.0009				
1,401	28,400	.4597	.0395											.0009	.0011				
1,411	28,600	.4594	.0398											.0009	.0014				
1,421	28,800	.4588	.0404											.0009	.0019				
1,430	29,000	.4585	.0407	.2626	.0387							.0226	.0222	.0010	.0024				
1,440	29,200	.4579	.0413											.0010	.0028				
1,450	29,400	.4576	.0416											.0010	.0033				
1,460	29,600	.4569	.0423											.0011	.0039				
1,470	29,800	.4564	.0428											.0012	.0044				
1,480	30,000	.4559	.0433	.2630	.0410	.0432	.0434	.0448	.0442	.0421	.0247	.0244		.0014	.0049				
1,490	30,200	.4553	.0439											.0018					
1,499	30,400	.4550	.0442											.0022					
1,509	30,600	.4545	.0447											.0031					
1,519	30,800	.4541	.0451											.0036					
1,529	31,000	.4537	.0455	.2637	.0430							.0268	.0265	.0042	.0081				
1,539	31,200	.4532	.0460											.0046					
1,549	31,400	.4525	.0467											.0053					
1,559	31,600	.4518	.0474											.0058					
1,568	31,800	.4511	.0481											.0064					
1,578	32,000	.4506	.0486	.2647	.0455							.0293	.0288	.0069	.0093				
1,588	32,200	.4501	.0491											.0072					
1,598	32,400	.4496	.0496											.0075					
1,608	32,600	.4493	.0499											.0080				.0009	
1,618	32,800	.4488	.0504											.0084				.0010	
1,628	33,000	.4485	.0507	.2651	.0478							.0316	.0301	.0088	.0118			.0010	
1,638	33,200	.4478	.0514											.0100					
1,647	33,400	.4474	.0518											.0100					
1,657	33,600	.4468	.0524											0.00					
1,667	33,800	.4464	.0528											.0101					
1,677	34,000	.4460	.0532	.2658	.0510							.0389	.0331	.0102	.0142			.0011	
1,686	34,200	.4454	.0538											.0113					
1,696	34,400	.4446	.0546											.0117					
1,706	34,600	.4441	.0551											.0123					
1,716	34,800	.4437	.0555											.0127					
1,726	35,000	.4433	.0559	.2667	.0528	.0553	.0553	.0564	.0556	.0541	.0360	.0355		.0132	.0162			.0013	
1,735	35,200	.4427	.0565											.0137				.0013	
1,745	35,400	.4423	.0569											.0144				.0015	
1,755	35,600	.4419	.0573											.0150				.0015	
1,765	35,800	.4413	.0579											.0154				.0016	

TABLE NO. 2—Continued.

Applied loads.		No. 11.			Total compression.													
Total.	Per square inch.	Length.	Permanent set.	Middle diameter.	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*
1,774	36,000	.4408	.0584	.2678	.0548	.....	.....	.....	.....	.....	.0386	.0375	.0157	.0182	.....	.0017	.....	.....
1,784	36,200	.4401	.0591	.....	.....	.....	.....	.....	.....	.....	.....	.....	.0160	.....	.....	.0017	.....	.....
1,794	36,400	.4396	.0596	.....	.....	.....	.....	.....	.....	.....	.....	.....	.0165	.....	.....	.0018	.....	.....
1,804	36,600	.4390	.0602	.....	.....	.....	.....	.....	.....	.....	.....	.....	.0173	.....	.....	.0021	.....	.....
1,814	36,800	.4386	.0606	.....	.....	.....	.....	.....	.....	.....	.....	.....	.0178	.....	.....	.0024	.....	.....
1,824	37,000	.4382	.0610	.2686	.0579	.....	.....	.....	.....	.....	.0411	.0404	.0183	.0213	.....	.0026	.....	.....
1,833	37,200	.4376	.0616	.....	.....	.....	.....	.....	.....	.....	.....	.....	.0184	.....	.....	.0030	.....	.....
1,843	37,400	.4368	.0624	.....	.....	.....	.....	.....	.....	.....	.....	.....	.0185	.....	.....	.0032	.....	.....
1,853	37,600	.4364	.0628	.....	.....	.....	.....	.....	.....	.....	.....	.....	.0186	.....	.....	.0037	.....	.....
1,863	37,800	.4362	.0630	.....	.....	.....	.....	.....	.....	.....	.....	.....	.0189	.....	.....	.0041	.....	.....
1,873	38,000	.4346	.0646	.2697	.0598	.....	.....	.....	.....	.....	.0435	.0426	.0194	.0227	.....	.0047	.....	.....
1,883	38,200	.4336	.0656	.....	.....	.....	.....	.....	.....	.....	.....	.....	.0202	.....	.....	.0053	.....	.....
1,892	38,400	.4332	.0660	.....	.....	.....	.....	.....	.....	.....	.....	.....	.0210	.....	.....	.0058	.....	.....
1,902	38,600	.4327	.0665	.....	.....	.....	.....	.....	.....	.....	.....	.....	.0215	.....	.....	.0065	.0011	.....
1,912	38,800	.4322	.0670	.....	.....	.....	.....	.....	.....	.....	.....	.....	.0220	.....	.....	.0070	.0012	.....
1,922	39,000	.4319	.0673	.2702	.....	.....	.....	.....	.....	.....	.0455	.0448	.0226	.0253	.....	.0075	.0012	.....
1,932	39,200	.4314	.0678	.....	.....	.....	.....	.....	.....	.....	.....	.....	.0232	.....	.....	.....	.0012	.....
1,942	39,400	.4310	.0682	.....	.....	.....	.....	.....	.....	.....	.....	.....	.0237	.....	.....	.....	.0013	.....
1,952	39,600	.4304	.0688	.....	.....	.....	.....	.....	.....	.....	.....	.....	.0240	.....	.....	.....	.0014	.....
1,962	39,800	.4299	.0693	.....	.....	.....	.....	.....	.....	.....	.....	.....	.0243	.....	.....	.....	.0014	.....
1,972	40,000	.4294	.0698	.2714	.0645	.0670	.0671	.0685	.0678	.0653	.0483	.0470	.0247	.0278	.....	.0106	.0015	.....
1,981	40,200	.4286	.0706	.....	.....	.....	.....	.....	.....	.....	.....	.....	.0252	.....	.....	.....	.0016	.....
1,991	40,400	.4283	.0709	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.0018	.....
2,001	40,600	.4275	.0717	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.0011	.....	.0022	.....
2,011	40,800	.4269	.0723	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.0011	.....	.0024	.....
2,021	41,000	.4265	.0727	.2720	.....	.....	.....	.....	.....	.....	.0500	.0491	.0287	.0306	.0011	.0128	.0026	.....
2,031	41,200	.4257	.0735	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.0011	.....	.0029	.....
2,041	41,400	.4253	.0739	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.0012	.....	.0033	.....
2,051	41,600	.4250	.0742	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.0013	.....	.0039	.....
2,061	41,800	.4243	.0749	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.0013	.....	.0043	.....
2,071	42,000	.4234	.0758	.2731	.....	.....	.....	.....	.....	.....	.0533	.0514	.0309	.0325	.0014	.0158	.0049	.....
2,080	42,200	.4226	.0766	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.0014	.....	.0054	.....
2,090	42,400	.4221	.0771	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.0015	.....	.0059	.....
2,100	42,600	.4216	.0776	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.0016	.....	.0065	.....
2,110	42,800	.4213	.0779	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.0018	.....	.0073	.....
2,120	43,000	.4206	.0786	.2740	.....	.....	.....	.....	.....	.....	.0557	.0557	.0389	.0348	.0020	.0186	.0078	.....
2,130	43,200	.4199	.0793	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.0022	.....	.0084	.....
2,139	43,400	.4194	.0798	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.0024	.....	.0089	.....
	43,600	.4186	.0806	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.0029	.....	.0094	.....

2,159	43,800	.4181	.0811													.0032		.0102	
2,169	44,000	.4174	.0818	.2748								.0582	.0564	.0362	.0367	.0038	.0210	.0108	
2,179	44,200	.4167	.0825													.0042			
2,189	44,400	.4163	.0829													.0048			
2,199	44,600	.4156	.0836													.0053			
2,208	44,800	.4152	.0840													.0058			
2,218	45,000	.4114	.0848	.2761	.0774	.0790	.0795	.0806	.0798	.0785	.0610	.0590	.0384	.0307	.0065	.0235	.0140	
2,228	45,200	.4137	.0855												.0070			
2,238	45,400	.4129	.0863												.0074			
2,248	45,600	.4124	.0868												.0078			
2,258	45,800	.4119	.0873												.0083			
2,268	46,000	.4112	.0880	.2770	.0800							.0637	.0619	.0403	.0422	.0091	.0265	.0168	
2,278	46,200	.4104	.0888																
2,287	46,400	.4096	.0896																
2,297	46,600	.4092	.0900																
2,307	46,800	.4087	.0905																
2,317	47,000	.4084	.0908	.2783	.0830							.0663	.0642	.0430	.0453	.0123	.0291	.0191	
2,327	47,200	.4078	.0914																
2,337	47,400	.4072	.0920																
2,346	47,600	.4065	.0927																
2,356	47,800	.4057	.0935																
2,360	48,000	.4051	.0941	.2793	.0851							.0686	.0655	.0456	.0472	.0151	.0321	.0230	
2,376	48,200	.4044	.0948																
2,386	48,400	.4037	.0955																
2,396	48,600	.4033	.0959																
2,406	48,800	.4027	.0965																
2,416	49,000	.4017	.0975	.2802	.0880							.0704	.0696	.0481	.0497	.0185	.0351	.0261	
2,426	49,200	.4010	.0982																
2,436	49,400	.4004	.0988																
2,445	49,600	.4000	.0992																
2,455	49,800	.3993	.0999																
2,465	50,000	.3987	.1005	.2816	.0905	.0918	.0921	.0934	.0930	.0915	.0738	.0714	.0506	.0522	.0208	.0375	.0274		
2,475	50,200	.3982	.1010																
2,485	50,400	.3977	.1015																
2,495	50,600	.3972	.1020																
2,504	50,800	.3963	.1029																
2,514	51,000	.3954	.1038	.2824	.0931							.0765	.0755	.0540	.0546	.0239	.0407	.0309	
2,524	51,200	.3949	.1043																
2,534	51,400	.3943	.1049																
2,544	51,600	.3936	.1056																
2,554	51,800	.3929	.1063																
2,564	52,000	.3924	.1068	.2835	.0957							.0790	.0766	.0556	.0574	.0278	.0425	.0331	
2,573	52,200	.3920	.1072																
2,583	52,400	.3913	.1079																
2,593	52,600	.3904	.1088																
2,603	52,800	.3898	.1094																
2,613	53,000	.3887	.1105	.2850	.0984							.0822	.0788	.0581	.0602	.0296	.0453	.0363	
2,623	53,200	.3883	.1109																

TABLE No. 2—Continued.

Applied loads.		No. 11.			Total compression.													
Total.	Per square inch.	Length.	Permanent set.	Middle diameter.	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Pounds.	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*
2,672	54,200	.3846	.1146															
2,682	54,400	.3839	.1163															
2,692	54,600	.3834	.1158															
2,702	54,800	.3827	.1165															
2,712	55,000	.3819	.1173	.2877	.1049	.1052	.1052	.1071	.1058	.1040	.0877	.0842	.0685	.0654	.0964	.0518	.0421	
2,721	55,200	.3813	.1179															
2,731	55,400	.3805	.1187															
2,741	55,600	.3800	.1192															
2,751	55,800	.3792	.1200															
2,761	56,000	.3788	.1204	.2894	.1065						.0897	.0868	.0668	.0675	.0397	.0544	.0454	
2,771	56,200	.3780	.1212															
2,780	56,400	.3772	.1220															
2,790	56,600	.3765	.1227															
2,800	56,800	.3756	.1236															
2,810	57,000	.3750	.1242	.2902	.1092						.0928	.0894	.0688	.0700	.0430	.0574	.0477	
2,820	57,200	.3747	.1245															
2,830	57,400	.3742	.1250															
2,840	57,600	.3734	.1258															
2,849	57,800	.3731	.1261															
2,859	58,000	.3723	.1269	.2913	.1116						.0952	.0918	.0718	.0729	.0460	.0596	.0505	
2,869	58,200	.3713	.1279															
2,879	58,400	.3703	.1289															
2,889	58,600	.3694	.1298															
2,899	58,800	.3685	.1307															
2,909	59,000	.3679	.1313	.2922	.1143						.0983	.0935	.0746	.0754	.0505	.0625	.0536	
2,919	59,200	.3672	.1320															
2,928	59,400	.3668	.1324															
2,938	59,600	.3664	.1328															
2,948	59,800	.3660	.1332															
2,958	60,000	.3654	.1338	.2937	.1170	.1180	.1185	.1200	.1179	.1177	.1010	.0976	.0774	.0787	.0535	.0656	.0562	

Description of the second series of initial compression of annealed copper cylinders for crusher gauges.

Nine hundred coppers were recompressed with a load corresponding to a pressure of 18,000 pounds per square inch on the head of the crusher gauge of one-tenth of a square inch sectional area. One hundred new coppers were compressed with the same load.

Three hundred were recompressed with a load corresponding to a pressure of 28,000 pounds per square inch on a crusher gauge; also, one hundred new coppers were compressed with the same load.

The first compression of the lots of 900 and 300 had been done with loads of 18,000 and 28,000 pounds per square inch, respectively, referred to the original sectional area of the coppers.

In addition to the initial compression of the coppers intended for use in crusher gauges, ten other coppers were compressed, according to instructions, with loads between 18,000 and 60,000 pounds per square inch, also referred to the area of the crusher gauges, increasing the loads with increments of 200 pounds per square inch. Each load was allowed to act on the copper a period of 15 seconds, the same as in the previous series of loadings.

In the tabulated details of these ten coppers (Table No. 3) are columns showing, (1) the applied loads in total pounds; (2) pounds per square inch referred to the crusher gauge; and (3) pounds per square inch referred to the original sectional areas of the coppers.

The third column might with propriety have been omitted, were it not for the fact that the first compression of the coppers had been made on that basis, and the present table therefore continues in conformity with the previous one, although the actual pressures per square inch on the coppers as they existed at the time of receiving the loads were necessarily much lower than indicated by column 3.

Thus, under the total load of 6,000 pounds the mean sectional areas of the coppers measured on the middle diameters of their lengths had increased to .1064 square inch, which gives an actual compression stress on the metal of 56,400 pounds per square inch.

The proper correction to be applied to the column of mean compression under stress to reduce to the corrected total sets, was made the subject of direct experiment for this series of tests, inasmuch as there was so great a diminution in length and increase in diameter of the coppers within the prescribed limit of 60,000 pounds per square inch.

This experiment showed the correction made in the earlier series of tests to have been substantially correct—strictly so for the higher loads of the first series.

In the present case it was found that for all loads above 3,500 total pounds pressure, the restoration in length remained constant at ″.0020, and this figure was used in making the correction upwards from that load.

Table No. 4 contains results with loads below and above those recorded in Table No. 3.

The following tables show the number of coppers which were permanently compressed the same amount:

INITIAL LOAD 18,000 *POUNDS PER SQUARE INCH ON CRUSHER GAUGE.*

RECOMPRESSED COPPERS.

Number.	Compression.	Number.	Compression.	Number.	Compression.
	Inch.		*Inch.*		*Inch.*
1	.0332	23	.0396	27	.0420
1	.0336	20	.0397	20	.0421
1	.0339	21	.0398	19	.0422
1	.0344	32	.0399	7	.0423
1	.0346	33	.0400	3	.0424
1	.0367	24	.0401	12	.0425
1	.0373	30	.0402	7	.0126
1	.0376	26	.0403	11	.0427
2	.0380	32	.0404	4	.0428
4	.0381	33	.0405	7	.0429
1	.0382	31	.0406	5	.0430
4	.0383	26	.0407	4	.0431
5	.0384	28	.0408	8	.0432
3	.0385	22	.0409	1	.0433
5	.0386	35	.0410	1	.0434
1	.0387	34	.0411	2	.0435
6	.0388	29	.0412	1	.0436
9	.0389	17	.0413	2	.0438
10	.0390	19	.0414	1	.0439
11	.0391	16	.0415	3	.0440
11	.0392	24	.0416	2	.0442
20	.0393	17	.0417	2	.0447
19	.0394	18	.0418		
19	.0395	14	.0419		

INITIAL LOAD 18,000 *POUNDS PER SQUARE INCH ON CRUSHER GAUGE.*

NEW COPPERS.

Number.	Compression.	Number.	Compression.	Number.	Compression.
	Inch.		*Inch.*		*Inch.*
1	.0507	7	.0564	4	.0580
1	.0538	4	.0565	4	.0581
1	.0544	5	.0566	1	.0582
1	.0549	3	.0567	1	.0584
1	.0552	1	.0568	4	.0585
2	.0553	6	.0569	1	.0586
2	.0554	3	.0570	1	.0588
2	.0555	5	.0571	1	.0590
4	.0556	3	.0572	1	.0591
1	.0557	3	.0573	1	.0593
3	.0558	3	.0574	1	.0596
2	.0559	1	.0575	1	.0601
3	.0560	3	.0576	1	.0606
1	.0561	4	.0577	1	.0607
3	.0562	1	.0578		
4	.0563	3	.0579		

INITIAL LOAD 28,000 POUNDS PER SQUARE INCH ON CRUSHER GAUGE.

RECOMPRESSED COPPERS.

Number.	Compression.	Number.	Compression.	Number.	Compression.
	Inch.		*Inch.*		*Inch.*
1	.0657	7	.0695	10	.0715
1	.0668	11	.0696	5	.0716
1	.0675	6	.0697	5	.0717
2	.0676	13	.0698	5	.0718
1	.0678	6	.0699	7	.0719
1	.0679	6	.0700	3	.0720
2	.0680	8	.0701	2	.0721
2	.0682	7	.0702	2	.0722
2	.0683	10	.0703	6	.0723
6	.0684	13	.0704	2	.0724
3	.0685	8	.0705	3	.0725
1	.0686	9	.0706	1	.0726
1	.0687	12	.0707	2	.0727
1	.0688	9	.0708	3	.0728
1	.0689	11	.0709	3	.0729
5	.0690	13	.0710	1	.0730
4	.0691	7	.0711	1	.0731
5	.0692	8	.0712	2	.0732
7	.0693	11	.0713	1	.0739
4	.0694	10	.0714		

INITIAL LOAD 28,000 POUNDS PER SQUARE INCH ON CRUSHER GAUGE.

NEW COPPERS.

Number.	Compression.	Number.	Compression.	Number.	Compression.
	Inch.		*Inch.*		*Inch.*
1	.1023	1	.1058	4	.1076
1	.1028	1	.1059	1	.1077
2	.1030	2	.1061	1	.1078
1	.1042	3	.1062	2	.1079
2	.1043	3	.1063	2	.1081
1	.1044	1	.1064	2	.1082
1	.1045	1	.1065	2	.1083
2	.1046	6	.1066	2	.1084
1	.1047	3	.1067	3	.1086
1	.1050	3	.1068	3	.1087
2	.1051	3	.1069	2	.1089
1	.1052	3	.1070	1	.1091
1	.1053	5	.1072	1	.1093
3	.1054	4	.1073	1	.1095
5	.1055	3	.1074	2	.1107
2	.1056	1	.1075	1	.1109

TABLE NO. 3.

Applied loads.			Total compression.										Corrected sets.		
Total.	Per square inch on crusher gauge.	Per square inch on original area of copper.	27	28	29	30	31	32	33	34	35	36	Mean.	Total.	From 18 000 to 60,000 pounds per square inch.	From 28,000 to 60,0 0 pounds per square inch.
Pounds.	*Pounds.*	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch*	*Inch.*	*Inch.*	*Inch.*
1,800	18,000	36,510	.0570	.0584	.0585	.0572	.0575	.0583	.0568	.0579	.0580	.0571	.05767	.05627	.....	.....
1,820	18,200	36,917	.0578	.0595	.0597	.0583	.0583	.0589	.0583	.0588	.0584	.0579	.05859	.05719	.00092	.....
1 840	18,400	37,323	.0590	.0607	.0605	.0594	.0596	.0599	.0591	.0595	.0599	.0585	.05961	.058 1	.00194	.....
1,860	18,600	37.708	.0599	.0617	.0617	.0604	.0603	.0612	.0598	.0604	.0606	.0597	.06057	.05917	.00290	.....
1,880	18,800	38,134	.0611	.0627	.0627	.0615	.0613	.0619	.0608	.0612	.0620	.0607	.06159	.06019	.00392	.....
1,900	19,000	38,540	.0622	.0637	.0632	.0622	.0625	.0626	.0617	.0627	.0624	.0619	.06251	.06111	.00484	.....
1,920	19,200	38,946	.0634	.0645	.0643	.0637	.0630	.0639	.0626	.0633	.0633	.0629	.06349	.06209	.00582	.....
1,940	19,400	39,352	.0640	.0661	.0656	.0650	.0643	.0647	.0635	.0643	.0648	.0637	.06460	.06320	.00693	.....
1,960	19,600	39,758	.0650	.0671	.0670	.0655	.0657	.0659	.0653	.0656	.0658	.0657	.06586	.06446	.00819	.....
1,980	19,800	40,163	.0663	.0684	.0677	.0665	.0666	.0671	.0660	.0664	.0675	.0665	.06690	.06550	.00923	.....
2,000	20,000	40,568	.0674	.0693	.0682	.0670	.0671	.0678	.0668	.0670	.0684	.0669	.06759	.06619	.00992	.....
2,020	20,200	40,974	.0684	.0700	.0692	.0684	.0682	.0688	.0673	.0684	.0694	.0679	.06860	.06720	.01093	.....
2,040	20,400	41,380	.0690	.0713	.0706	.0698	.0696	.0699	.0685	.0697	.0700	.0692	.06976	.06836	.01209	.....
2,060	20,600	41,785	.0704	.0722	.0716	.0708	.0701	.0709	.0698	.0708	.0717	.0705	.07088	.06938	.01311	.....
2,080	20,800	42,191	.0713	.0730	.0728	.0714	.0714	.0719	.0707	.0717	.0725	.0712	.07179	.07029	.01402	.....
2,100	21,000	42,597	.0723	.0742	.0738	.0731	.0723	.0733	.0720	.0731	.0731	.0725	.07297	.07147	.01520	.....
2,120	21,200	43,002	.0733	.0752	.0748	.0740	.0742	.0744	.0729	.0738	.0743	.0732	.07401	.07251	.01624	.....
2,140	21,400	43,407	.0737	.0763	.0763	.0747	.0752	.0752	.0739	.0751	.0756	.0743	.07503	.07353	.01726	.....
2,160	21,600	43,813	.0742	.0777	.0769	.0753	.0759	.0762	.0748	.0760	.0765	.0758	.07593	.07443	.01816	.....
2,180	21,800	44,218	.0757	.0788	.0780	.0767	.0768	.0770	.0757	.0770	.0778	.0767	.07702	.07552	.01925	.....
2,200	22,000	44,624	.0770	.0797	.0787	.0780	.0780	.0786	.0767	.0778	.0787	.0776	.07808	.07658	.02031	.....
2,220	22,200	45,030	.0787	.0807	.0799	.0793	.0789	.0795	.0778	.0787	.0797	.0785	.07917	.07767	.02140	.....
2,240	22,400	45,436	.0795	.0819	.0814	.0805	.0798	.0805	.0786	.0795	.0804	.0796	.08016	.07866	.02239	.....
2,260	22,600	45,842	.0807	.0825	.0828	.0814	.0813	.0820	.0798	.0810	.0815	.0805	.08135	.07985	.02358	.....
2,280	22,800	46,248	.0815	.0835	.0834	.0825	.0826	.0826	.0810	.0822	.0830	.0814	.08237	.08077	.02450	.....
2,300	23,000	46,653	.0826	.0847	.0844	.0832	.0832	.0837	.0824	.0833	.0839	.0837	.08351	.08191	.02564	.....
2,320	23,200	47,059	.0837	.0857	.0857	.0840	.0840	.0847	.0833	.0841	.0849	.0844	.08445	.08285	.02658	.....
2,340	23,400	47,464	.0845	.0868	.0867	.0855	.0852	.0855	.0842	.0853	.0857	.0854	.08548	.08388	.02761	.....
2,360	23,600	47,870	.0857	.0881	.0875	.0865	.0867	.0868	.0853	.0862	.0870	.0862	.08660	.08500	.02873	.....
2,380	23,800	48,275	.0870	.0892	.0885	.0870	.0878	.0878	.0865	.0877	.0880	.0871	.08772	.08612	.02985	.....
2,400	24,000	48,681	.0881	.0905	.0895	.0886	.0888	.0890	.0881	.0894	.0899	.0885	.08897	.08737	.03110	.....
2,420	24,200	49,086	.0890	.0912	.0910	.0897	.0899	.0896	.0888	.0902	.0901	.0894	.08989	.08829	.03202	.....
2,440	24,400	49,492	.0903	.0922	.0922	.0910	.0908	.0909	.0901	.0909	.0911	.0908	.09098	.08938	.03311	.....
[illegible]	[illegible]	[illegible]	.0914	.0936	.0932	.0921	.0918	.0920	.0908	.0920	.0921	.0918	.09203	.09042	.03416	.....
2,500	25,000	50,719	.0924	.0950	.0942	.0930	.0929	.0930	.0917	.0929	.0934	.0925	.09310	.09150	.03523	.....
[illegible]	[illegible]	[illegible]	.0934	.0960	.0953	.0945	.0934	.0941	.0930	.0945	.0950	.0942	.09433	.09293	.03630	.....

2,520	25,200	51,116	.0943	.0973	.0962	.0953	.0950	.0955	.0938	.0952	.0960	.0952	.09538	.09368	.03741	.....
2,540	25,400	51,522	.0958	.0985	.0973	.0963	.0966	.0965	.0949	.0960	.0969	.0960	.09618	.09478	.03851	.....
2,560	25,600	51,927	.0968	.0993	.0985	.0975	.0977	.0982	.0961	.0970	.0983	.0970	.09770	.09600	.03973	.....
2,580	25,800	52,333	.0980	.0998	.0995	.0983	.0985	.0990	.0974	.0984	.0991	.09 7	.09857	.09687	.04060	.....
2,600	26,000	52,738	.0990	.1015	.1007	.0993	.0994	.1002	.0984	.0995	.1002	.0992	.09974	.09804	.04177	.....
2,620	26,200	53,144	.0998	.1025	.1022	.1005	.1009	.1012	.0991	.1006	.1013	.1010	.10091	.09921	.04294	.....
2,640	26,400	53,550	.1007	.1040	.1042	.1017	.1021	.1018	.1002	.1013	.1023	.1020	.10193	.10023	.04396	.....
2,660	26,600	53,956	.1020	.1048	.1042	.1028	.1032	.1030	.1015	.1027	.1034	.1030	.10306	.10146	.04509	.....
2,680	26,800	54,362	.1032	.1055	.1049	.1037	.1040	.1038	.1026	.1036	.1045	.1039	.10397	.10227	.04600	.....
2,700	27,000	54,767	.1048	.1067	.1062	.1050	.1050	.1050	.1038	.1048	.1055	.1048	.10516	.10346	.04719	.....
2,720	27,200	55,172	.1057	.1075	.1070	.1064	.1064	.1060	.1054	.1064	.1067	.1057	.10632	.10462	.04835	.....
2,740	27,400	55,578	.1064	.1090	.1082	.1075	.1075	.1072	.1063	.1070	.1079	.1069	.10739	.10569	.04942	.....
2,760	27,600	55,983	.1073	.1105	.1094	.1089	.1086	.1084	.1075	.1080	.1089	.1081	.10856	.10686	.05059	.....
2,780	27,800	56,389	.1084	.1116	.1107	.1102	.1100	.1091	.1085	.1090	.1104	.1092	.10971	.10801	.05174	.....
2,800	28,000	56,795	.1098	.1125	.1117	.1112	.1112	.1105	.1097	.1103	.1116	.1100	.11085	.10915	.05288	.....•
2,820	28,200	57,200	.1109	.1132	.1127	.1125	.1122	.1116	.1105	.1118	.1125	.1117	.11196	.11026	.05399	.00111
2,840	28,400	57,606	.1121	.1139	.1138	.1137	.1130	.1130	.1115	.1128	.1136	.1129	.11303	.11133	.05506	.00218
2,860	28,600	58,012	.1135	.1158	.1150	.1147	.1140	.1139	.1121	.1139	.1145	.1137	.11411	.11231	.05604	.00316
2,880	28,800	58,418	.1145	.1170	.1165	.1158	.1151	.1148	.1131	.1151	.1152	.1148	.11519	.11339	.05712	.00424
2,900	29,000	58,823	.1158	.1182	.1179	.1169	.1168	.1165	.1144	.1164	.1174	.1160	.11660	.11480	.05853	.00565
2,920	29,200	59,228	.1165	.1196	.1186	.1177	.1178	.1174	.1155	.1173	.1180	.1170	.11754	.11574	.05947	.00659
2,940	29,400	59,633	.1177	.1208	.1197	.1184	.1188	.1185	.1170	.1185	.1194	.1189	.11877	.11697	.06070	.00782
2,960	29,600	60,039	.1184	.1215	.1207	.1200	.1196	.1195	.1178	.1196	.1204	.1199	.11974	.11794	.06167	.00879
2,980	29,800	60,445	.1199	.1227	.1220	.1207	.1210	.1206	.1184	.1205	.1215	.1205	.12078	.11898	.06271	.00983
3,000	30,000	60,851	.1217	.1242	.1225	.1214	.1217	.1212	.1190	.1213	.1222	.1220	.12172	.11992	.06365	.01077
3,020	30,200	61,257	.1224	.1257	.1235	.1220	.1229	.1226	.1206	.1225	.1235	.1228	.12285	.12105	.06478	.01190
3,040	30,400	61,662	.1238	.1265	.1250	.1234	.1237	.1238	.1220	.1232	.1245	.1236	.12395	.12215	.06588	.01300
3,060	30,600	62,068	.1247	.1273	.1263	.1247	.1253	.1250	.1230	.1242	.1260	.1249	.12514	.12334	.06707	.01419
3,080	30,800	62,474	.1256	.1278	.1276	.1260	.1267	.1263	.1243	.1260	.1270	.1260	.12633	.12453	.06826	.01538
3,100	31,000	62,879	.1266	.1292	.1288	.1274	.1278	.1280	.1258	.1267	.1277	.1284	.12764	.12584	.06957	.01669
3,120	31,200	63,285	.1273	.1305	.1297	.1287	.1283	.1288	.1270	.1278	.1292	.1292	.12865	.12685	.07058	.01770
3,140	31,400	63,691	.1286	.1315	.1308	.1297	.1297	.1299	.1280	.1288	.1306	.1300	.12976	.12796	.07169	.01881
3,160	31,600	64,097	.1299	.1325	.1319	.1305	.1309	.1310	.1288	.1302	.1316	.1308	.13081	.12901	.07274	.01986
3,180	31,800	64,503	.1313	.1337	.1333	.1318	.1320	.1320	.1296	.1312	.1322	.1320	.13191	.13011	.07374	.02086
3,200	32,000	64,909	.1326	.1347	.1348	.1336	.1330	.1330	.1306	.1324	.1336	.1329	.13312	.13112	.07485	.02197
3,220	32,200	65,315	.1340	.1361	.1356	.1348	.1341	.1340	.1322	.1331	.1345	.1334	.13418	.13228	.07601	.02313
3,240	32,400	65,721	.1348	.1377	.1366	.1355	.1353	.1347	.1337	.1341	.1357	.1346	.13527	.13337	.07710	.02422
3,260	32,600	66,126	.1357	.1382	.1375	.1363	.1363	.1360	.1344	.1352	.1368	.1362	.13626	.13436	.07809	.02521
3,280	32,800	66,532	.1370	.1391	.1383	.1370	.1375	.1370	.1353	.1362	.1377	.1370	.13721	.13531	.07904	.02616
3,300	33,000	66,938	.1380	.1402	.1393	.1377	.1378	.1379	.1366	.1375	.1388	.1382	.13820	.13610	.08013	.02725
3,320	33,200	67,343	.1389	.1415	.1405	.1387	.1401	.1394	.1378	.1388	.1402	.1391	.13950	.13760	.08133	.02845
3,340	33,400	67,748	.1393	.1430	.1417	.1398	.1414	.1407	.1384	.1397	.1417	.1410	.14072	.13882	.08255	.02967
3,360	33,600	68,153	.1409	.1437	.1427	.1414	.1427	.1419	.1395	.1406	.1425	.1420	.14179	.13989	.08362	.03074
3,380	33,800	68,559	.1419	.1449	.1440	.1429	.1434	.1425	.1408	.1422	.1433	.1430	.14289	.14099	.08472	.03184
3,400	34,000	68,965	.1432	.1460	.1448	.1434	.1445	.1440	.1423	.1430	.1445	.1438	.14395	.14205	.08578	.03290
3,420	34,200	69,370	.1443	.1469	.1467	.1447	.1458	.1450	.1432	.1440	.1458	.1450	.14504	.14314	.08687	.03399
3,440	34,400	69,776	.1452	.1481	.1475	.1459	.1470	.1458	.1442	.1450	.1463	.1460	.14610	.14420	.08793	.03505
3,460	34,600	70,182	.1460	.1492	.1482	.1474	.1479	.1468	.1456	.1464	.1478	.1470	.14723	.14533	.08906	.03618
3,480	34,800	70,587	.1475	.1498	.1490	.1484	.1490	.1479	.1463	.1476	.1490	.1483	.14828	.14638	.09011	.03723
3,500	35,000	70,993	.1485	.1518	.1503	.1492	.1503	.1488	.1476	.1486	.1505	.1498	.14954	.14754	.09127	.03839
3,520	35,200	71,399	.1497	.1528	.1514	.1501	.1510	.1502	.1490	.1497	.1512	.1509	.15060	.14860	.09233	.03945
3,540	35,400	71,805	.1514	.1540	.1527	.1509	.1523	.1512	.1506	.1510	.1520	.1520	.15181	.14981	.09354	.04066

TABLE No. 3—Continued.

Applied loads			Total compression.												Corrected sets.	
Total.	Per square inch on crusher gauge.	Per square inch on original area of copper.	27	28	29	30	31	32	33	34	35	36	Mean.	Total.	From 18,000 to 60,000 pounds per square inch.	From 28,000 to 60,000 pounds per square inch.
Pounds.	*Pounds.*	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*
3,560	35,600	72,210	.1527	.1550	.1540	.1520	.1532	.1526	.1515	.1517	.1532	.1534	.15293	.15093	.09166	.04178
3,580	35,800	72,616	.1534	.1559	.1547	.1536	.1543	.1532	.1524	.1530	.1542	.1545	.15392	.15192	.09555	.04277
3,600	36,000	73,022	.1542	.1571	.1556	.1552	.1558	.1545	.1530	.1543	.1559	.1552	.15508	.15308	.09681	.04393
3,620	36,200	73,427	.1554	.1582	.1567	.1560	.1565	.1557	.1536	.1552	.1567	.1560	.15600	.15400	.09773	.04485
3,640	36,400	73,833	.1562	.1590	.1578	.1570	.1575	.1567	.1549	.1562	.1577	.1570	.15700	.15500	.09873	.04585
3,660	36,600	74,239	.1573	.1601	.1592	.1585	.1587	.1575	.1565	.1571	.1587	.1583	.15819	.15619	.09992	.04704
3,680	36,800	74,645	.1583	.1609	.1598	.1595	.1601	.1585	.1572	.1580	.1601	.1593	.15917	.15717	.10090	.04802
3,700	37,000	75,050	.1595	.1619	.1611	.1609	.1613	.1603	.1584	.1593	.1612	.1605	.16044	.15844	.10217	.04929
3,720	37,200	75,456	.1604	.1632	.1620	.1616	.1623	.1616	.1598	.1599	.1619	.1619	.16146	.15946	.10319	.05031
3,740	37,400	75,862	.1617	.1643	.1629	.1623	.1636	.1621	.1610	.1612	.1630	.1630	.16256	.16056	.10429	.05141
3,760	37,600	76,267	.1626	.1660	.1647	.1633	.1646	.1633	.1615	.1625	.1640	.1639	.16364	.16164	.10537	.05249
3,780	37,800	76,673	.1637	.1673	.1656	.1642	.1653	.1648	.1630	.1634	.1652	.1646	.16471	.16271	.10644	.05356
3,800	38,000	77,079	.1653	.1682	.1664	.1657	.1663	.1655	.1642	.1647	.1662	.1658	.16585	.16385	.10758	.05470
3,820	38,200	77,484	.1664	.1690	.1679	.1665	.1672	.1662	.1660	.1654	.1675	.1672	.16693	.16493	.10866	.05578
3,840	38,400	77,890	.1671	.1700	.1691	.1673	.1681	.1672	.1670	.1665	.1690	.1687	.16800	.16600	.10973	.05685
3,860	38,600	78,296	.1680	.1712	.1703	.1685	.1695	.1685	.1681	.1680	.1700	.1695	.16916	.16716	.11089	.05801
3,880	38,800	78,702	.1692	.1723	.1711	.1700	.1710	.1699	.1689	.1687	.1712	.1703	.17031	.16831	.11204	.05916
3,900	39,000	79,108	.1704	.1738	.1720	.1710	.1718	.1709	.1698	.1694	.1725	.1710	.17126	.16926	.11299	.06011
3,920	39,200	79,513	.1714	.1748	.1729	.1718	.1729	.1720	.1707	.1707	.1737	.1727	.17236	.17036	.11409	.06121
3,940	39,400	79,918	.1723	.1758	.1740	.1729	.1738	.1726	.1714	.1717	.1744	.1738	.17327	.17127	.11500	.06212
3,960	39,600	80,324	.1734	.1764	.1750	.1737	.1750	.1734	.1720	.1727	.1753	.1748	.17417	.17217	.11590	.06302
3,980	39,800	80,730	.1747	.1772	.1761	.1747	.1761	.1748	.1737	.1736	.1760	.1756	.17525	.17325	.11698	.06401
4,000	40,000	81,136	.1760	.1786	.1769	.1761	.1780	.1757	.1748	.1747	.1769	.1764	.17641	.17441	.11814	.06526
4,020	40,200	81,541	.1772	.1792	.1776	.1769	.1787	.1764	.1760	.1757	.1781	.1775	.17743	.17543	.11906	.06618
4,040	40,400	81,947	.1780	.1802	.1787	.1780	.1794	.1775	.1770	.1772	.1793	.1780	.17842	.17642	.12015	.06727
4,060	40,600	82,353	.1788	.1810	.1797	.1790	.1803	.1786	.1778	.1780	.1802	.1795	.17929	.17729	.12102	.06814
4,080	40,800	82,758	.1796	.1823	.1807	.1801	.1811	.1797	.1795	.1789	.1813	.1812	.18044	.17844	.12217	.06929
4,100	41,000	83,104	.1803	.1836	.1822	.1809	.1821	.1812	.1802	.1800	.1828	.1825	.18158	.17958	.12331	.07043
4,120	41,200	83,569	.1816	.1847	.1832	.1822	.1829	.1821	.1813	.1812	.1835	.1837	.18264	.18064	.12437	.07149
4,140	41,400	83,975	.1827	.1856	.1840	.1837	.1841	.1832	.1820	.1821	.1842	.1843	.18359	.18159	.12532	.07244
4,160	41,600	84,381	.1836	.1862	.1850	.1843	.1852	.1815	.1830	.1833	.1853	.1855	.18459	.18259	.12632	.07344
4,180	41,800	84,787	.1850	.1875	.1858	.1848	.1861	.1852	.1848	.1840	.1860	.1865	.18547	.18347	.12720	.07432
4,200	42,000	85,193	.1862	.1891	.1868	.1858	.1872	.1860	.1850	.1848	.1875	.1873	.18657	.18457	.12830	.07542
4,220	42,200	85,598	.1870	.1900	.1882	.1873	.1883	.1869	.1862	.1857	.1887	.1884	.18767	.18567	.12940	.07652
4,240	42,400	86,004	.1878	.1908	.1894	.1881	.1895	.1878	.1872	.1867	.1895	.1895	.18863	.18663	.13036	.07748
260	42,600	86,410	.1887	.1918	.1904	.1890	.1905	.1884	.1882	.1876	.1905	.1909	.18961	.18761	.13137	.07849
			.1897	.1928	.1912	.1902	.1915	.1904	.1888	.1885	.1920	.1914	.19060	.18860	.13239	.07951
			.1908	.1934	.1922	.1912	.1927	.1913	.1896	.1899	.1929	.1925	.19163	.18963	.13336	.08048

4,320	43,200	87,627	.1916	.1950	.1930	.1922	.1933	.1923	.1911	.1909	.1940	.1934	.19268	.19068	.13441	.08153
4,340	43,400	88,032	.1925	.1956	.1938	.1932	.1941	.1935	.1930	.1924	.1950	.1942	.19373	.19173	.13546	.08258
4,360	43,600	88,437	.1936	.1969	.1952	.1942	.1948	.1945	.1944	.1931	.1955	.1948	.19470	.19270	.13643	.08355
4,380	43,800	88,843	.1947	.1974	.1960	.1957	.1961	.1952	.1952	.1940	.1962	.1960	.19565	.19365	.13738	.08450
4,400	44,000	89,249	.1957	.1987	.1971	.1967	.1972	.1959	.1958	.1947	.1970	.1969	.19657	.19457	.13830	.08542
4,420	44,200	89,654	.1967	.1997	.1985	.1972	.1980	.1966	.1965	.1955	.1982	.1985	.19754	.19554	.13927	.08639
4,440	44,400	90,060	.1975	.2004	.1998	.1978	.1969	.1975	.1978	.1966	.1995	.1992	.19850	.19650	.14023	.08735
4,460	44,600	90,465	.1986	.2010	.2005	.1988	.1999	.1985	.1983	.1973	.2005	.2000	.19934	.19734	.14107	.08819
4,480	44,800	90,871	.1993	.2018	.2016	.1994	.2015	.1994	.1993	.1988	.2012	.2015	.20038	.19838	.14211	.08923
4,500	45,000	91,277	.2000	.2027	.2025	.2010	.2030	.2005	.2000	.1996	.2020	.2030	.20143	.19943	.14316	.09028
4,520	45,200	91,682	.2010	.2037	.2032	.2020	.2035	.2018	.2005	.2000	.2030	.2039	.20226	.20026	.14399	.09111
4,540	45,400	92,088	.2016	.2044	.2038	.2027	.2041	.2031	.2013	.2015	.2035	.2049	.20303	.20103	.14476	.09188
4,560	45,600	92,494	.2025	.2050	.2048	.2037	.2050	.2039	.2028	.2022	.2047	.2056	.20397	.20197	.14570	.09282
4,580	45,800	93,900	.2035	.2059	.2057	.2053	.2058	.2045	.2039	.2038	.2060	.2062	.20501	.20301	.14674	.09386
4,600	46,000	93,306	.2048	.2064	.2066	.2060	.2069	.2056	.2048	.2044	.2066	.2068	.20589	.20389	.14762	.09474
4,620	46,200	93,711	.2056	.2071	.2076	.2068	.2082	.2066	.2054	.2051	.2074	.2074	.20672	.20472	.14845	.09557
4,640	46,400	94,117	.2066	.2080	.2085	.2076	.2092	.2074	.2062	.2058	.2085	.2083	.20761	.20561	.14934	.09646
4,660	46,600	94,522	.2075	.2090	.2100	.2081	.2099	.2082	.2077	.2066	.2094	.2095	.20859	.20659	.15032	.09744
4,680	46,800	94,928	.2085	.2098	.2105	.2087	.2103	.2090	.2084	.2075	.2101	.2103	.20931	.20731	.15104	.09816
4,700	47,000	95,334	.2093	.2108	.2116	.2098	.2112	.2097	.2094	.2085	.2110	.2111	.21024	.20824	.15197	.09909
4,720	47,200	95,740	.2105	.2120	.2122	.2111	.2127	.2107	.2101	.2095	.2118	.2124	.21130	.20930	.15303	.10015
4,740	47,400	96,146	.2112	.2136	.2130	.2122	.2132	.2114	.2110	.2110	.2130	.2130	.21226	.21026	.15399	.10111
4,760	47,600	96,551	.2123	.2145	.2137	.2130	.2146	.2121	.2120	.2117	.2138	.2142	.21319	.21119	.15492	.10204
4,780	47,800	96,957	.2131	.2152	.2146	.2135	.2150	.2133	.2129	.2122	.2149	.2157	.21404	.21204	.15577	.10289
4,800	48,000	97,363	.2143	.2166	.2154	.2143	.2156	.2143	.2138	.2130	.2155	.2164	.21492	.21292	.15665	.10377
4,820	48,200	97,768	.2150	.2175	.2162	.2156	.2166	.2152	.2146	.2140	.2164	.2174	.21585	.21385	.15758	.10470
4,840	48,400	98,174	.2158	.2184	.2173	.2164	.2181	.2165	.2156	.2147	.2171	.2185	.21684	.21484	.15857	.10569
4,860	48,600	98,580	.2170	.2192	.2182	.2170	.2188	.2170	.2168	.2160	.2180	.2192	.21772	.21572	.15945	.10657
4,880	48,800	98,985	.2176	.2202	.2190	.2175	.2197	.2175	.2174	.2167	.2188	.2200	.21844	.21644	.16017	.10729
4,900	49,000	99,391	.2184	.2210	.2202	.2187	.2203	.2182	.2185	.2173	.2202	.2206	.21934	.21734	.16107	.10819
4,920	49,200	99,796	.2192	.2218	.2210	.2200	.2210	.2188	.2191	.2179	.2210	.2214	.22012	.21812	.16185	.10897
4,940	49,400	100,202	.2199	.2228	.2214	.2205	.2216	.2198	.2197	.2184	.2216	.2221	.22078	.21878	.16251	.10963
4,960	49,600	100,608	.2205	.2234	.2220	.2210	.2230	.2208	.2202	.2194	.2222	.2227	.22152	.21952	.16325	.11037
4,980	49,800	101,014	.2212	.2239	.2226	.2220	.2234	.2215	.2210	.2205	.2230	.2231	.22222	.22022	.16395	.11107
5,000	50,000	101,420	.2222	.2244	.2240	.2229	.2245	.2228	.2219	.2214	.2238	.2239	.22318	.22118	.16491	.11203
5,020	50,200	101,825	.2233	.2253	.2245	.2235	.2249	.2237	.2228	.2225	.2252	.2250	.22407	.22207	.16580	.11292
5,040	50,400	102,231	.2245	.2258	.2250	.2242	.2260	.2243	.2235	.2230	.2259	.2258	.22480	.22280	.16653	.11365
5,060	50,600	102,637	.2252	.2267	.2258	.2253	.2265	.2251	.2243	.2235	.2265	.2264	.22553	.22353	.16726	.11438
5,080	50,800	103,043	.2257	.2277	.2265	.2261	.2276	.2259	.2252	.2244	.2275	.2270	.22637	.22437	.16810	.11522
5,100	51,000	103,448	.2263	.2287	.2274	.2274	.2282	.2267	.2262	.2251	.2282	.2280	.22722	.22522	.16895	.11607
5,120	51,200	103,854	.2269	.2296	.2286	.2279	.2291	.2275	.2270	.2258	.2290	.2290	.22804	.22604	.16977	.11689
5,140	51,400	104,259	.2276	.2304	.2299	.2285	.2298	.2283	.2278	.2265	.2296	.2299	.22883	.22683	.17056	.11768
5,160	51,600	104,665	.2285	.2312	.2304	.2290	.2307	.2289	.2284	.2272	.2305	.2311	.22960	.22750	.17132	.11844
5,180	51,800	105,071	.2296	.2319	.2309	.2300	.2318	.2298	.2288	.2280	.2315	.2319	.23042	.22842	.17215	.11927
5,200	52,000	105,477	.2304	.2327	.2317	.2310	.2325	.2305	.2296	.2290	.2324	.2323	.23121	.22921	.17294	.12006
5,220	52,200	105,882	.2308	.2334	.2325	.2318	.2328	.2311	.2307	.2297	.2329	.2333	.23190	.22990	.17363	.12075
5,240	52,400	106,288	.2315	.2340	.2333	.2327	.2338	.2316	.2315	.2302	.2335	.2340	.23261	.23061	.17434	.12146
5,260	52,600	106,694	.2325	.2350	.2340	.2333	.2346	.2324	.2324	.2310	.2341	.2345	.23338	.23138	.17511	.12223
5,280	52,800	107,099	.2335	.2356	.2347	.2340	.2352	.2333	.2329	.2317	.2348	.2352	.23409	.23209	.17582	.12294
5,300	53,000	107,505	.2340	.2364	.2356	.2348	.2359	.2340	.2337	.2329	.2357	.2359	.23489	.23289	.17662	.12374
5,320	53,200	107,910	.2348	.2372	.2367	.2352	.2368	.2349	.2342	.2339	.2364	.2364	.23565	.23365	.17738	.12450
5,340	53,400	108,316	.2355	.2382	.2375	.2361	.2377	.2356	.2352	.2348	.2373	.2370	.23649	.23449	.17822	.12534

TABLE No. 3—Continued.

Applied loads			Total compression.											Corrected sets.		
Total.	Per square inch on crusher gauge.	Per square inch on original area of copper.	27	28	29	30	31	32	33	34	35	36	Mean.	Total.	From 18,000 to 60,000 pounds per square inch.	From 28,000 to 60,000 pounds per square inch.
Pounds.	*Pounds.*	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*
3,560	35,600	72,210	.1527	.1550	.1540	.1520	.1532	.1526	.1515	.1517	.1532	.1534	.15293	.15093	.09166	.04178
3,580	35,800	72,616	.1534	.1559	.1547	.1536	.1543	.1532	.1524	.1530	.1542	.1545	.15392	.15192	.09355	.04277
3,600	36,000	73,022	.1542	.1571	.1556	.1552	.1558	.1545	.1530	.1543	.1559	.1552	.15508	.15308	.09681	.04393
3,620	36,200	73,427	.1554	.1582	.1567	.1560	.1565	.1557	.1536	.1552	.1567	.1560	.15600	.15400	.09773	.04485
3,640	36,400	73,833	.1562	.1590	.1578	.1570	.1575	.1567	.1549	.1562	.1577	.1570	.15700	.15500	.09873	.04585
3,660	36,600	74,239	.1573	.1601	.1592	.1585	.1587	.1575	.1565	.1571	.1587	.1583	.15819	.15619	.09992	.04704
3,680	36,800	74,645	.1583	.1609	.1598	.1595	.1601	.1585	.1572	.1580	.1601	.1593	.15917	.15717	.10090	.04802
3,700	37,000	75,050	.1595	.1619	.1611	.1609	.1613	.1603	.1584	.1593	.1612	.1605	.16044	.15844	.10217	.04929
3,720	37,200	75,456	.1604	.1632	.1620	.1616	.1623	.1616	.1598	.1599	.1619	.1619	.16146	.15946	.10319	.05031
3,740	37,400	75,862	.1617	.1643	.1629	.1623	.1636	.1621	.1610	.1612	.1630	.1630	.16256	.16056	.10429	.05141
3,760	37,600	76,267	.1626	.1660	.1647	.1643	.1646	.1633	.1615	.1625	.1640	.1639	.16364	.16164	.10537	.05249
3,780	37,800	76,673	.1637	.1673	.1656	.1642	.1653	.1648	.1630	.1631	.1652	.1646	.16471	.16271	.10644	.05356
3,800	38,000	77,079	.1653	.1682	.1664	.1657	.1665	.1655	.1642	.1647	.1662	.1658	.16585	.16385	.10758	.05470
3,820	38,200	77,484	.1664	.1690	.1679	.1665	.1672	.1662	.1660	.1654	.1675	.1672	.16693	.16493	.10866	.05578
3,840	38,400	77,890	.1671	.1700	.1691	.1675	.1681	.1672	.1670	.1665	.1690	.1687	.16800	.16600	.10973	.05685
3,860	38,600	78,296	.1680	.1712	.1703	.1685	.1695	.1685	.1681	.1680	.1700	.1695	.16916	.16716	.11089	.05801
3,880	38,800	78,702	.1692	.1728	.1711	.1700	.1710	.1699	.1689	.1687	.1712	.1703	.17031	.16831	.11204	.05916
3,900	39,000	79,108	.1704	.1738	.1720	.1710	.1718	.1709	.1698	.1694	.1725	.1710	.17126	.16926	.11299	.06011
3,920	39,200	79,513	.1714	.1748	.1729	.1718	.1729	.1720	.1707	.1707	.1737	.1727	.17236	.17036	.11409	.06121
3,940	39,400	79,918	.1723	.1758	.1740	.1729	.1738	.1726	.1714	.1717	.1744	.1738	.17327	.17127	.11500	.06212
3,960	39,600	80,324	.1734	.1764	.1750	.1737	.1750	.1734	.1720	.1727	.1753	.1748	.17417	.17217	.11590	.06302
3,980	39,800	80,730	.1747	.1772	.1761	.1747	.1761	.1748	.1737	.1736	.1760	.1756	.17525	.17325	.11698	.06401
4,000	40,000	81,136	.1760	.1786	.1769	.1761	.1780	.1757	.1748	.1747	.1769	.1764	.17641	.17441	.11814	.06526
4,020	40,200	81,541	.1772	.1792	.1776	.1769	.1787	.1764	.1760	.1757	.1781	.1775	.17733	.17533	.11906	.06618
4,040	40,400	81,947	.1780	.1802	.1787	.1780	.1794	.1775	.1770	.1772	.1793	.1789	.17842	.17642	.12015	.06727
4,060	40,600	82,353	.1788	.1810	.1797	.1790	.1803	.1786	.1778	.1780	.1802	.1795	.17929	.17729	.12102	.06814
4,080	40,800	82,758	.1796	.1823	.1807	.1801	.1811	.1797	.1793	.1789	.1813	.1812	.18044	.17844	.12217	.06929
4,100	41,000	83,164	.1803	.1836	.1822	.1809	.1821	.1812	.1802	.1800	.1828	.1825	.18158	.17958	.12331	.07043
4,120	41,200	83,569	.1816	.1847	.1832	.1822	.1829	.1821	.1813	.1812	.1835	.1837	.18264	.18064	.12437	.07149
4,140	41,400	83,975	.1827	.1856	.1840	.1837	.1841	.1832	.1820	.1821	.1842	.1843	.18359	.18159	.12532	.07244
4,160	41,600	84,381	.1836	.1862	.1850	.1843	.1852	.1845	.1830	.1833	.1853	.1855	.18459	.18259	.12632	.07344
4,180	41,800	84,787	.1850	.1875	.1858	.1848	.1861	.1853	.1848	.1840	.1860	.1865	.18547	.18347	.12720	.07432
4,200	42,000	85,193	.1862	.1891	.1868	.1858	.1872	.1860	.1870	.1848	.1875	.1873	.18657	.18457	.12830	.07542
4,220	42,200	85,598	.1870	.1900	.1882	.1873	.1883	.1869	.1902	.1857	.1887	.1884	.18767	.18567	.12940	.07652
4,240	42,400	86,004	.1878	.1908	.1894	.1881	.1895	.1878	.1872	.1867	.1895	.1895	.18883	.18683	.13056	.07768
4,260	42,600	86,410	.1887	.1918	.1904	.1890	.1905	.1884	.1882	.1876	.1905	.1900	.18984	.18784	.13147	.07849
	...	...	.1897	.1928	.1912	.1902	.1915	.1904	.1888	.1886	.1920	.1914	.19090	.18890	.13240	.07951
			.1908	.1934	.1922	.1914	.1927	.1912	.1895	.1899	.1929	.1925	.19193	.18993	.13340	.08048

4,320	43,200	87,627	.1916	.1950	.1930	.1922	.1933	.1923	.1911	.1909	.1940	.1934	.19268	.19068	.13441	.08153
4,340	43,400	88,032	.1925	.1956	.1938	.1932	.1941	.1935	.1930	.1924	.1950	.1942	.19373	.19173	.13546	.08258
4,360	43,600	88,437	.1936	.1969	.1952	.1942	.1948	.1945	.1941	.1931	.1955	.1948	.19470	.19270	.13643	.08355
4,380	43,800	88,843	.1947	.1974	.1960	.1957	.1961	.1952	.1952	.1940	.1962	.1960	.19565	.19365	.13738	.08450
4,400	44,000	89,249	.1957	.1987	.1971	.1967	.1972	.1959	.1958	.1947	.1970	.1969	.19657	.19457	.13830	.08542
4,420	44,200	89,654	.1967	.1997	.1985	.1972	.1980	.1966	.1965	.1955	.1982	.1985	.19754	.19554	.13927	.08639
4,440	44,400	90,060	.1975	.2004	.1998	.1978	.1989	.1975	.1978	.1966	.1995	.1992	.19850	.19650	.14023	.08735
4,460	44,600	90,465	.1986	.2010	.2005	.1988	.1999	.1985	.1983	.1973	.2005	.2000	.19934	.19734	.14107	.08819
4,480	44,800	90,871	.1993	.2018	.2016	.1994	.2015	.1994	.1993	.1988	.2012	.2015	.20038	.19838	.14211	.08923
4,500	45,000	91,277	.2000	.2027	.2025	.2010	.2030	.2005	.2000	.1996	.2020	.2030	.20143	.19943	.14316	.09028
4,520	45,200	91,682	.2010	.2037	.2032	.2020	.2035	.2018	.2005	.2000	.2030	.2039	.20226	.20026	.14399	.09111
4,540	45,400	92,088	.2016	.2044	.2038	.2027	.2041	.2031	.2013	.2015	.2035	.2049	.20303	.20103	.14476	.09188
4,560	45,600	92,494	.2025	.2050	.2048	.2037	.2050	.2039	.2028	.2022	.2047	.2056	.20397	.20197	.14570	.09282
4,580	45,800	93,900	.2035	.2059	.2057	.2053	.2058	.2045	.2039	.2033	.2060	.2062	.20501	.20301	.14674	.09386
4,600	46,000	93,306	.2048	.2064	.2066	.2060	.2069	.2056	.2043	.2044	.2066	.2068	.20589	.20389	.14762	.09474
4,620	46,200	93,711	.2056	.2071	.2076	.2068	.2082	.2066	.2054	.2051	.2074	.2074	.20672	.20472	.14845	.09557
4,640	46,400	94,117	.2066	.2080	.2085	.2076	.2092	.2074	.2062	.2058	.2085	.2083	.20761	.20561	.14934	.09646
4,660	46,600	94,522	.2075	.2090	.2100	.2081	.2099	.2082	.2077	.2066	.2094	.2095	.20859	.20659	.15032	.09744
4,680	46,800	94,928	.2085	.2098	.2105	.2087	.2103	.2090	.2084	.2075	.2101	.2103	.20931	.20731	.15104	.09816
4,700	47,000	95,334	.2093	.2108	.2116	.2098	.2112	.2097	.2094	.2085	.2110	.2111	.21024	.20824	.15197	.09909
4,720	47,200	95,740	.2105	.2120	.2122	.2111	.2127	.2107	.2101	.2095	.2118	.2124	.21130	.20930	.15303	.10015
4,740	47,400	96,146	.2112	.2136	.2130	.2122	.2132	.2114	.2110	.2110	.2130	.2130	.21226	.21026	.15399	.10111
4,760	47,600	96,551	.2123	.2145	.2137	.2130	.2146	.2121	.2120	.2117	.2138	.2142	.21319	.21119	.15492	.10204
4,780	47,800	96,957	.2131	.2152	.2146	.2135	.2150	.2133	.2129	.2122	.2149	.2157	.21404	.21204	.15577	.10289
4,800	48,000	97,363	.2143	.2166	.2154	.2143	.2156	.2143	.2138	.2130	.2155	.2164	.21492	.21292	.15665	.10377
4,820	48,200	97,768	.2150	.2175	.2162	.2156	.2166	.2152	.2146	.2140	.2164	.2174	.21585	.21385	.15758	.10470
4,840	48,400	98,174	.2158	.2184	.2173	.2164	.2181	.2165	.2156	.2147	.2171	.2185	.21684	.21484	.15857	.10569
4,860	48,600	98,580	.2170	.2192	.2182	.2170	.2188	.2170	.2168	.2160	.2180	.2192	.21772	.21572	.15945	.10657
4,880	48,800	98,985	.2176	.2202	.2190	.2175	.2197	.2175	.2174	.2167	.2188	.2200	.21844	.21644	.16017	.10729
4,900	49,000	99,391	.2184	.2210	.2202	.2187	.2203	.2182	.2185	.2173	.2202	.2206	.21934	.21734	.16107	.10819
4,920	49,200	99,796	.2192	.2218	.2210	.2200	.2210	.2188	.2191	.2179	.2210	.2214	.22012	.21812	.16185	.10897
4,940	49,400	100,202	.2199	.2228	.2214	.2205	.2216	.2198	.2197	.2184	.2216	.2221	.22078	.21878	.16251	.10963
4,960	49,600	100,608	.2205	.2234	.2220	.2210	.2230	.2208	.2202	.2194	.2222	.2227	.22152	.21952	.16325	.11037
4,980	49,800	101,014	.2212	.2239	.2226	.2220	.2234	.2215	.2210	.2205	.2230	.2231	.22222	.22022	.16395	.11107
5,000	50,000	101,420	.2222	.2244	.2240	.2229	.2245	.2228	.2219	.2214	.2238	.2239	.22318	.22118	.16491	.11203
5,020	50,200	101,825	.2233	.2253	.2245	.2235	.2249	.2237	.2228	.2225	.2252	.2250	.22407	.22207	.16580	.11292
5,040	50,400	102,231	.2245	.2258	.2250	.2242	.2260	.2243	.2235	.2230	.2259	.2258	.22480	.22280	.16653	.11365
5,060	50,600	102,637	.2252	.2267	.2258	.2253	.2265	.2251	.2243	.2235	.2265	.2264	.22553	.22353	.16726	.11438
5,080	50,800	103,043	.2257	.2277	.2268	.2261	.2276	.2250	.2252	.2244	.2275	.2270	.22637	.22437	.16810	.11522
5,100	51,000	103,448	.2263	.2287	.2274	.2274	.2282	.2267	.2262	.2251	.2282	.2280	.22722	.22522	.16895	.11607
5,120	51,200	103,854	.2269	.2296	.2286	.2279	.2291	.2275	.2270	.2256	.2290	.2290	.22804	.22604	.16977	.11689
5,140	51,400	104,259	.2276	.2304	.2299	.2285	.2298	.2283	.2278	.2265	.2296	.2299	.22883	.22083	.17056	.11768
5,160	51,600	104,665	.2285	.2312	.2304	.2290	.2307	.2289	.2284	.2272	.2305	.2311	.22950	.22750	.17132	.11844
5,180	51,800	105,071	.2296	.2319	.2309	.2300	.2318	.2298	.2288	.2280	.2315	.2319	.23042	.22842	.17215	.11927
5,200	52,000	105,477	.2304	.2327	.2317	.2310	.2325	.2305	.2296	.2290	.2324	.2323	.23121	.22921	.17294	.12006
5,220	52,200	105,882	.2308	.2334	.2325	.2318	.2328	.2311	.2307	.2297	.2329	.2333	.23190	.22990	.17363	.12075
5,240	52,400	106,288	.2315	.2340	.2333	.2327	.2338	.2316	.2315	.2302	.2335	.2340	.23261	.23061	.17434	.12146
5,260	52,600	106,694	.2325	.2350	.2340	.2333	.2346	.2324	.2324	.2310	.2341	.2345	.23338	.23138	.17511	.12223
5,280	52,800	107,099	.2335	.2356	.2347	.2340	.2352	.2333	.2329	.2317	.2348	.2352	.23409	.23209	.17582	.12294
5,300	53,000	107,505	.2340	.2364	.2356	.2348	.2359	.2340	.2337	.2329	.2357	.2359	.23489	.23289	.17662	.12374
5,320	53,200	107,910	.2348	.2372	.2367	.2352	.2368	.2349	.2342	.2339	.2364	.2364	.23565	.23365	.17738	.12450
5,340	53,400	108,316	.2355	.2382	.2375	.2361	.2377	.2356	.2352	.2348	.2373	.2370	.23649	.23449	.17822	.12534

TABLE No. 3—Continued.

Applied loads.			Total compression.											Corrected sets.		
Total.	Per square inch on crusher gauge.	Per square inch on original area of copper.	27	28	29	30	31	32	33	34	35	36	Mean.	Total.	From 18,000 to 60,000 pounds per square inch.	From 28,000 to 60,000 pounds per square inch.
Pounds.	*Pounds.*	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*
5,360	53,600	108,722	.2362	.2387	.2382	.2370	.2387	.2369	.2359	.2364	.2382	.2380	.23732	.23532	.17905	.12017
5,380	53,800	109,128	.2370	.2394	.2392	.2378	.2396	.2380	.2365	.2362	.2390	.2395	.23822	.23622	.17995	.12707
5,400	54,000	109,533	.2380	.2402	.2401	.2387	.2404	.2385	.2378	.2369	.2398	.2100	.23904	.23704	.18077	.12789
5,420	54,200	109,939	.2388	.2412	.2406	.2391	.2411	.2388	.2388	.2374	.2405	.2406	.23969	.23769	.18142	.12854
5,440	54,400	110,344	.2393	.2417	.2409	.2395	.2415	.2395	.2392	.2382	.2414	.2411	.24023	.23823	.18196	.12908
5,460	54,600	110,750	.2402	.2423	.2416	.2405	.2423	.2401	.2405	.2387	.2410	.2418	.24100	.23900	.18273	.12985
5,480	54,800	111,156	.2409	.2429	.2421	.2418	.2432	.2407	.2413	.2392	.2430	.2427	.24178	.23978	.18351	.13063
5,500	55,000	111,561	.2419	.2438	.2427	.2426	.2438	.2413	.2420	.2403	.2434	.2439	.24257	.24057	.18430	.13142
5,520	55,200	111,961	.2426	.2446	.2436	.2430	.2442	.2423	.2424	.2411	.2438	.2444	.24320	.24120	.18492	.13205
5,540	55,400	112,373	.2433	.2455	.2445	.2434	.2452	.2432	.2432	.2420	.2443	.2453	.24399	.24199	.18572	.13284
5,560	55,600	112,779	.2443	.2459	.2451	.2440	.2460	.2441	.2437	.2425	.2450	.2460	.24466	.24266	.18639	.13351
5,580	55,800	113,184	.2448	.2463	.2462	.2447	.2464	.2447	.2442	.2432	.2457	.2466	.24528	.24328	.18701	.13413
5,600	56,000	113,590	.2453	.2470	.2467	.2457	.2469	.2452	.2447	.2437	.2466	.2472	.24590	.24390	.18763	.13475
5,620	56,200	113,996	.2458	.2478	.2474	.2461	.2475	.2457	.2452	.2442	.2474	.2476	.24647	.24447	.18820	.13532
5,640	56,400	114,401	.2465	.2485	.2479	.2467	.2481	.2466	.2457	.2452	.2479	.2480	.24711	.24511	.18884	.13596
5,660	56,600	114,807	.2470	.2494	.2485	.2477	.2490	.2471	.2465	.2461	.2485	.2487	.24785	.24585	.18958	.13670
5,680	56,800	115,213	.2478	.2500	.2491	.2483	.2497	.2477	.2472	.2466	.2490	.2493	.24847	.24647	.19020	.13732
5,700	57,000	115,618	.2486	.2507	.2497	.2489	.2504	.2485	.2481	.2471	.2498	.2504	.24922	.24722	.19095	.13807
5,720	57,200	116,024	.2496	.2513	.2503	.2497	.2510	.2492	.2486	.2477	.2504	.2512	.24990	.24790	.19163	.13875
5,740	57,400	116,429	.2505	.2520	.2512	.2504	.2515	.2497	.2497	.2484	.2513	.2521	.25068	.24868	.19241	.13953
5,760	57,600	116,835	.2510	.2525	.2519	.2510	.2522	.2505	.2500	.2491	.2521	.2530	.25139	.24939	.19312	.14024
5,780	57,800	117,241	.2516	.2531	.2525	.2515	.2530	.2511	.2510	.2497	.2527	.2534	.25196	.24996	.19369	.14081
5,800	58,000	117,647	.2520	.2540	.2534	.2522	.2538	.2520	.2513	.2503	.2531	.2540	.25261	.25061	.19434	.14146
5,820	58,200	118,053	.2525	.2545	.2543	.2529	.2542	.2525	.2520	.2511	.2537	.2545	.25322	.25122	.19495	.14207
5,840	58,400	118,459	.2530	.2549	.2547	.2536	.2549	.2532	.2525	.2515	.2541	.2553	.25375	.25175	.19548	.14260
5,860	58,600	118,865	.2539	.2557	.2551	.2543	.2561	.2537	.2532	.2521	.2549	.2560	.25448	.25248	.19621	.14333
5,880	58,800	119,271	.2545	.2564	.2558	.2548	.2565	.2545	.2538	.2528	.2557	.2564	.25512	.25312	.19685	.14397
5,900	59,000	119,677	.2552	.2572	.2563	.2553	.2568	.2552	.2547	.2535	.2564	.2571	.25577	.25377	.19750	.14462
5,920	59,200	120,083	.2556	.2577	.2574	.2561	.2578	.2558	.2551	.2543	.2570	.2577	.25645	.25445	.19818	.14530
5,940	59,400	120,488	.2563	.2582	.2580	.2569	.2583	.2567	.2560	.2549	.2577	.2581	.25711	.25511	.19884	.14596
5,960	59,600	120,894	.2573	.2587	.2584	.2574	.2587	.2577	.2567	.2554	.2581	.2588	.25772	.25572	.19945	.14657
5,980	59,800	121,299	.2578	.2598	.2588	.2580	.2594	.2582	.2572	.2560	.2588	.2592	.25832	.25632	.20005	.14717
6,000	60,000	121,704	.2583	.2605	.2592	.2586	.2606	.2588	.2580	.2565	.2594	.2602	.25901	.25701	.20074	.14786
Lengths after compression..			.2404	.2591	.2405	.2406	.2386	.2402	.....	.2423	.2392	.....	.....	.....	.....	.....
Maximum middle diameters.			.368	.369	.368	.368	.370	.368	.....	.368	.368	.....	.....	.....	.....	.....
Maximum end diameters ...			.345	.348	.348	.350	.346	.340	.....	.343	.343	.....	.....	.....	.....	.....

TABLE NO. 4.

Applied loads.			Total compression.											
Total.	Per square inch on crusher gauge.	Per square inch on original area of copper.	27	28	29	30	31	32	33	34	35	36	Mean.	Corrected sets.
Pounds.	*Pounds.*	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*
100	1,000	.....	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	.....	.....
250	2,500	5,071	.0005	.0005	.0003	.0006	.0003	.0005	.0002	.0002	.0003	.0002	.00036	.00036
300	3,000	6,086	.0006	.0006	.0007	.0007	.0003	.0007	.0005	.0003	.0005	.0003	.00052	.00042
350	3,500	7,100	.0007	.0007	.0008	.0009	.0005	.0009	.0008	.0005	.0007	.0004	.00069	.00059
400	4,000	8,114	.0011	.0012	.0011	.0012	.0010	.0013	.0010	.0008	.0010	.0012	.00109	.00089
450	4,500	9,128	.0020	.0022	.0022	.0020	.0022	.0027	.0015	.0021	.0020	.0015	.00204	.00184
500	5,000	10,142	.0029	.0036	.0037	.0036	.0038	.0033	.0033	.0030	.0035	.0030	.00337	.00307
550	5,500	11,156	.0048	.0053	.0048	.0049	.0055	.0059	.0046	.0046	.0050	.0050	.00504	.00474
600	6,000	12,170	.0062	.0069	.0070	.0065	.0066	.0069	.0062	.0066	.0066	.0060	.00645	.00605
650	6,500	13,184	.0080	.0087	.0086	.0080	.0087	.0090	.0070	.0081	.0080	.0083	.00824	.00784
700	7,000	14,198	.0097	.0107	.0104	.0102	.0105	.0105	.0094	.0100	.0100	.0097	.01011	.00961
750	7,500	15,212	.0115	.0122	.0120	.0116	.0119	.0123	.0115	.0118	.0120	.0122	.01190	.01140
800	8,000	16,226	.0133	.0142	.0141	.0136	.0134	.0140	.0133	.0138	.0134	.0130	.01361	.01301
850	8,500	17,240	.0145	.0160	.0160	.0155	.0159	.0166	.0150	.0154	.0155	.0151	.01555	.01495
900	9,000	18,254	.0173	.0183	.0178	.0179	.0176	.0178	.0170	.0175	.0182	.0170	.01764	.01694
950	9,500	19,268	.0192	.0202	.0201	.0195	.0200	.0200	.0192	.0198	.0197	.0191	.01968	.01898
1,000	10,000	20,280	.0214	.0224	.0216	.0211	.0277	.0215	.0202	.0208	.0212	.0207	.02136	.02056
1,050	10,500	21,294	.0233	.0243	.0244	.0235	.0245	.0235	.0229	.0237	.0239	.0233	.02373	.02293
1,100	11,000	22,308	.0252	.0262	.0265	.0255	.0256	.0260	.0249	.0255	.0259	.0249	.02562	.02482
1,150	11,500	23,322	.0275	.0290	.0283	.0280	.0280	.0286	.0274	.0281	.0281	.0273	.02803	.02713
1,200	12,000	24,336	.0293	.0305	.0306	.0296	.0298	.0307	.0293	.0295	.0299	.0294	.02986	.02896
1,250	12,500	25,350	.0318	.0328	.0330	.0325	.0322	.0330	.0315	.0320	.0325	.0317	.03230	.03140
1,300	13,000	26,364	.0337	.0351	.0348	.0338	.0343	.0347	.0335	.0341	.0343	.0335	.03408	.03308
1,350	13,500	27,378	.0362	.0372	.0375	.0362	.0365	.0369	.0358	.0365	.0374	.0359	.03661	.03561
1,400	14,000	28,392	.0383	.0400	.0390	.0384	.0387	.0395	.0384	.0388	.0392	.0384	.03887	.03787
1,450	14,500	29,416	.0403	.0420	.0420	.0408	.0413	.0410	.0403	.0407	.0410	.0403	.04097	.03987
1,500	15,000	30,426	.0425	.0441	.0441	.0430	.0437	.0449	.0435	.0430	.0435	.0432	.04355	.04255
1,550	15,500	31,440	.0458	.0465	.0467	.0452	.0460	.0460	.0452	.0460	.0459	.0449	.04582	.04472
1,600	16,000	32,454	.0472	.0487	.0492	.0477	.0481	.0486	.0475	.0476	.0484	.0475	.04805	.04685
1,650	16,500	33,468	.0500	.0513	.0515	.0500	.0502	.0510	.0502	.0507	.0502	.0498	.05049	.04929
1,700	17,000	34,482	.0523	.0537	.0538	.0523	.0527	.0535	.0522	.0528	.0530	.0518	.05281	.05151
1,750	17,500	35,496	.0546	.0560	.0565	.0550	.0551	.0551	.0546	.0554	.0553	.0546	.05522	.05392
6,020	60,200	122,100	.....	.....	.....	.....	.....	.....	.2589	.....	.....	.2610	.....	.....
			.....	.....	.....	.....	.....	.....	.2592	.....	.....		.....	.....

TABLE NO. 3—Continued.

Applied loads.			Total compression.											Corrected sets.		
Total.	Per square inch on crusher gauge.	Per square inch on original area of copper.	27	28	29	30	31	32	33	34	35	36	Mean.	Total.	From 18,000 to 60,000 pounds per square inch.	From 28,000 to 60,000 pounds per square inch.
Pounds.	*Pounds.*	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*
5,360	53,600	108,722	.2362	.2387	.2382	.2370	.2387	.2369	.2359	.23 4	.2382	.2380	.23732	.23532	.17905	.12017
5,380	53,800	109,128	.2370	.2394	.2392	.2378	.2396	.2380	.2365	.2362	.2390	.2395	.23822	.23622	.17995	.12707
5,400	54,000	109,533	.2380	.2402	.2401	.2387	.2404	.2385	.2378	.2360	.2398	.2400	.23904	.23704	.18077	.12789
5,420	54,200	109,939	.2388	.2412	.2406	.2391	.2411	.2388	.2388	.2374	.2405	.2406	.23969	.23769	.18142	.12854
5,440	54,400	110,344	.2393	.2417	.2409	.2395	.2415	.2395	.2392	.2382	.2414	.2411	.24023	.23823	.18196	.12908
5,460	54,600	110,750	.2402	.2423	.2416	.2405	.2423	.2401	.2405	.2387	.2410	.2418	.24100	.23900	.18273	.12985
5,480	54,800	111,156	.2409	.2429	.2421	.2418	.2432	.2407	.2413	.2392	.2430	.2427	.24178	.23978	.18351	.13063
5,500	55,000	111,561	.2419	.2438	.2427	.2426	.2438	.2413	.2420	.2403	.2434	.2439	.24257	.24057	.18430	.13142
5,520	55,200	111,961	.2426	.2446	.2436	.2430	.2442	.2423	.2424	.2411	.2438	.2444	.24320	.24120	.18493	.13205
5,540	55,400	112,373	.2433	.2455	.2445	.2434	.2452	.2432	.2432	.2420	.2443	.2453	.24399	.24199	.18572	.13284
5,560	55,600	112,779	.2443	.2459	.2451	.2440	.2460	.2441	.2437	.2425	.2450	.2460	.24466	.24266	.18639	.13351
5,580	55,800	113,184	.2448	.2463	.2462	.2447	.2464	.2447	.2442	.2432	.2457	.2466	.24528	.24328	.18701	.13413
5,600	56,000	113,590	.2453	.2470	.2467	.2457	.2469	.2452	.2447	.2437	.2466	.2472	.24590	.24390	.18763	.13475
5,620	56,200	113,996	.2458	.2478	.2474	.2461	.2475	.2457	.2452	.2442	.2474	.2476	.24647	.24447	.18820	.13532
5,640	56,400	114,401	.2465	.2485	.2479	.2467	.2481	.2466	.2457	.2452	.2479	.2480	.24711	.24511	.18884	.13596
5,660	56,600	114,807	.2470	.2494	.2485	.2477	.2490	.2471	.2465	.2461	.2485	.2487	.24785	.24585	.18958	.13670
5,680	56,800	115,213	.2478	.2500	.2491	.2483	.2497	.2477	.2472	.2466	.2490	.2493	.24847	.24647	.19020	.13732
5,700	57,000	115,618	.2486	.2507	.2497	.2489	.2504	.2485	.2481	.2471	.2498	.2504	.24922	.24722	.19095	.13807
5,720	57,200	116,024	.2496	.2513	.2503	.2497	.2510	.2492	.2486	.2477	.2504	.2512	.24990	.24790	.19163	.13875
5,740	57,400	116,429	.2505	.2520	.2512	.2504	.2515	.2497	.2497	.2484	.2513	.2521	.25068	.24868	.19241	.13953
5,760	57,600	116,835	.2510	.2525	.2519	.2510	.2522	.2505	.2506	.2491	.2521	.2530	.25139	.24939	.19312	.14024
5,780	57,800	117,241	.2516	.2531	.2525	.2515	.2530	.2511	.2510	.2497	.2527	.2534	.25196	.24996	.19369	.14081
5,800	58,000	117,647	.2520	.2540	.2534	.2522	.2538	.2520	.2513	.2503	.2531	.2540	.25261	.25061	.19434	.14146
5,820	58,200	118,053	.2525	.2545	.2543	.2529	.2542	.2525	.2520	.2511	.2537	.2545	.25322	.25122	.19495	.14207
5,840	58,400	118,459	.2539	.2549	.2547	.2535	.2549	.2532	.2525	.2515	.2541	.2553	.25375	.25175	.19548	.14260
5,860	58,600	118,865	.2539	.2557	.2551	.2543	.2561	.2537	.2532	.2521	.2549	.2560	.25448	.25248	.19621	.14333
5,880	58,800	119,271	.2545	.2564	.2558	.2548	.2565	.2545	.2538	.2528	.2557	.2564	.25512	.25312	.19685	.14397
5,900	59,000	119,677	.2552	.2572	.2563	.2553	.2568	.2552	.2547	.2535	.2564	.2571	.25577	.25377	.19750	.14462
5,920	59,200	120,083	.2556	.2577	.2574	.2561	.2578	.2558	.2551	.2543	.2570	.2577	.25645	.25445	.19818	.14530
5,940	59,400	120,488	.2563	.2582	.2580	.2569	.2583	.2567	.2560	.2549	.2577	.2581	.25711	.25511	.19884	.14596
5,960	59,600	120,894	.2573	.2587	.2584	.2574	.2587	.2577	.2567	.2554	.2581	.2588	.25772	.25572	.19945	.14657
5,980	59,800	121,299	.2578	.2598	.2588	.2580	.2594	.2582	.2572	.2560	.2588	.2592	.25832	.25632	.20005	.14717
6,000	60,000	121,704	.2583	.2605	.2592	.2586	.2606	.2588	.2580	.2565	.2594	.2602	.25901	.25701	.20074	.14786
Lengths after compression..			.2404	.2391	.2405	.2406	.2386	.2402	.....	.2423	.2392	.....	.....	.....	.....	.....
Maximum middle diameters.			.368	.369	.368	.368	.370	.368	.....	.368	.368	.....	.....	.....	.....	.....
Maximum end diameters ...			.345	.348	.348	.350	.346	.340	.....	.343	.343	.....	.....	.....	.....	.....

TABLE NO. 4.

Applied loads.			Total compression.											
Total.	Per square inch on crusher gauge.	Per square inch on original area of copper.	27	28	29	30	31	32	33	34	35	36	Mean.	Corrected sets.
Pounds.	*Pounds.*	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*
100	1,000	.....	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	.....	.....
250	2,500	5,071	.0005	.0005	.0003	.0006	.0003	.0005	.0002	.0002	.0003	.0002	.00036	.00036
300	3,000	6,086	.0006	.0006	.0007	.0007	.0003	.0007	.0005	.0003	.0005	.0003	.00052	.00042
350	3,500	7,100	.0007	.0007	.0008	.0009	.0005	.0009	.0008	.0005	.0007	.0004	.00069	.00059
400	4,000	8,114	.0011	.0012	.0011	.0012	.0010	.0013	.0010	.0008	.0010	.0012	.00109	.00089
450	4,500	9,128	.0020	.0022	.0022	.0020	.0022	.0027	.0015	.0021	.0020	.0015	.00204	.00184
500	5,000	10,142	.0029	.0036	.0037	.0036	.0038	.0033	.0033	.0030	.0035	.0030	.00337	.00307
550	5,500	11,156	.0048	.0053	.0048	.0049	.0055	.0059	.0046	.0046	.0050	.0050	.00504	.00474
600	6,000	12,170	.0062	.0069	.0070	.0065	.0066	.0069	.0062	.0066	.0066	.0060	.00645	.00605
650	6,500	13,184	.0080	.0087	.0086	.0080	.0087	.0090	.0070	.0081	.0080	.0083	.00824	.00784
700	7,000	14,198	.0097	.0107	.0104	.0102	.0105	.0105	.0094	.0100	.0100	.0097	.01011	.00961
750	7,500	15,212	.0115	.0122	.0120	.0116	.0119	.0123	.0115	.0118	.0120	.0122	.01190	.01140
800	8,000	16,226	.0133	.0142	.0141	.0136	.0134	.0140	.0133	.0138	.0134	.0130	.01361	.01301
850	8,500	17,240	.0145	.0160	.0160	.0155	.0159	.0166	.0150	.0154	.0155	.0151	.01555	.01495
900	9,000	18,254	.0173	.0183	.0178	.0179	.0176	.0178	.0170	.0175	.0182	.0170	.01764	.01694
950	9,500	19,266	.0192	.0202	.0201	.0195	.0200	.0200	.0192	.0198	.0197	.0191	.01968	.01898
1,000	10,000	20,280	.0214	.0224	.0216	.0211	.0277	.0215	.0202	.0208	.0212	.0207	.02136	.02056
1,050	10,500	21,294	.0233	.0243	.0244	.0235	.0245	.0235	.0229	.0237	.0239	.0233	.02373	.02293
1,100	11,000	22,308	.0252	.0262	.0265	.0255	.0256	.0260	.0240	.0255	.0259	.0249	.02562	.02482
1,150	11,500	23,322	.0275	.0290	.0283	.0280	.0280	.0286	.0274	.0281	.0281	.0273	.02803	.02713
1,200	12,000	24,336	.0293	.0305	.0306	.0296	.0298	.0307	.0293	.0295	.0299	.0294	.02986	.02896
1,250	12,500	25,350	.0318	.0328	.0330	.0325	.0322	.0330	.0315	.0320	.0325	.0317	.03230	.03140
1,300	13,000	26,364	.0337	.0351	.0348	.0338	.0343	.0347	.0335	.0341	.0343	.0335	.03408	.03308
1,350	13,500	27,378	.0362	.0372	.0375	.0362	.0365	.0369	.0358	.0365	.0374	.0359	.03661	.03561
1,400	14,000	28,392	.0383	.0400	.0390	.0384	.0387	.0395	.0384	.0388	.0392	.0384	.03887	.03787
1,450	14,500	29,416	.0403	.0420	.0420	.0408	.0418	.0410	.0403	.0407	.0410	.0403	.04097	.03987
1,500	15,000	30,426	.0425	.0441	.0441	.0430	.0437	.0449	.0435	.0430	.0435	.0432	.04355	.04255
1,550	15,500	31,440	.0458	.0465	.0467	.0452	.0460	.0460	.0452	.0460	.0450	.0449	.04582	.04472
1,600	16,000	32,454	.0472	.0487	.0492	.0477	.0481	.0486	.0475	.0476	.0484	.0475	.04805	.04685
1,650	16,500	33,468	.0500	.0513	.0515	.0500	.0502	.0510	.0502	.0507	.0502	.0498	.05049	.04929
1,700	17,000	34,482	.0523	.0537	.0538	.0523	.0527	.0535	.0522	.0528	.0530	.0518	.05281	.05151
1,750	17,500	35,496	.0546	.0560	.0565	.0550	.0551	.0551	.0546	.0554	.0553	.0546	.05522	.05392
6,020	60,200	122,109	.....	.....	.....	.....	.....	.....	.2589	.....	.....	.2610	.....	.....
			.....	.....	.....	.....	.....	.....	.2592	.....	.....	.....	.....	.....

TABLE No. 4—Continued.

Applied loads.			Total compression.											Corrected sets.
Total.	Per square inch on crusher gauge.	Per square inch on original area of copper.	27	28	29	30	31	32	33	34	35	36	Mean.	
Pounds.	*Pounds.*	*Pounds.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*
6,100	61,000	123,732							.2613			.2625		
6,120	61,200	124,138							.2618					
6,140	61,400	124,543							.2623			.2637		
6,160	61,600	124,949							.2628					
6,180	61,800	125,355							.2636					
6,200	62,000	125,761							.2642			.2654		
6,220	62,200	126,167							.2647					
6,240	62,400	126,572							.2649			.2670		
6,260	62,600	126,978							.2658					
6,280	62,800	127,383							.2665					
6,300	63,000	127,788							.2672			.2681		
6,320	63,200	128,194							.2675					
6,340	63,400	128,600							.2678			.2692		
6,360	63,600	129,006							.2684					
6,380	63,800	129,412							.2687					
6,400	64,000	129,817							.2696			.2708		
6,450	64,500	130,832							.2718			.2724		
6,500	65,000	131,846							.2722			.2735		
6,550	65,500	132,860							.2731					
6,600	66,000	133,874							.2742			.2758		
6,650	66,500	134,888							.2757					
6,700	67,000	135,903							.2768			.2782		
6,750	67,500	136,919							.2784					
6,800	68,000	137,935							.2793			.2809		
6,850	68,500	138,945							.2805					
6,900	69,000	139,961							.2820			.2829		
6,950	69,500	140,977							.2839					
7,000	70,000	141,987							.2836			.2855		
7,050	70,500	143,002							.2842					
7,100	71,000	144,018							.2868			.2870		
7,150	71,500	145,034							.2880					
7,200	72,000	146,049							.2890			.2902		
7,250	72,500	147,059							.2897					
7,300	73,000	148,074							.2910			.2925		
7,350	73,500	149,088							.2920					
7,400	74,000	150,102							.2932			.2945		

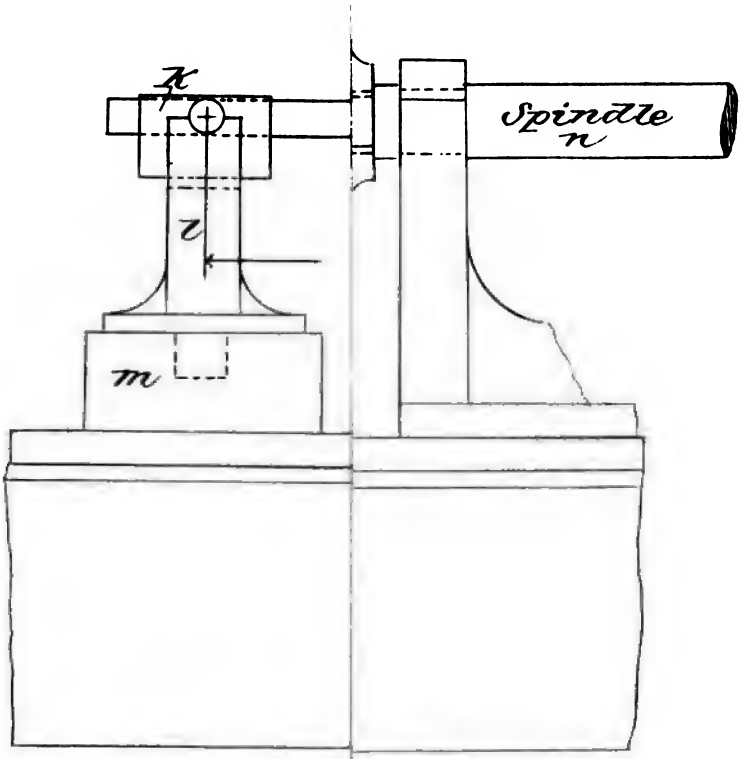
| | | |

ENDURANCE TESTS

OF

ROTATING SHAFTS OF STEEL AND WROUGHT IRON.

Apparhafts.



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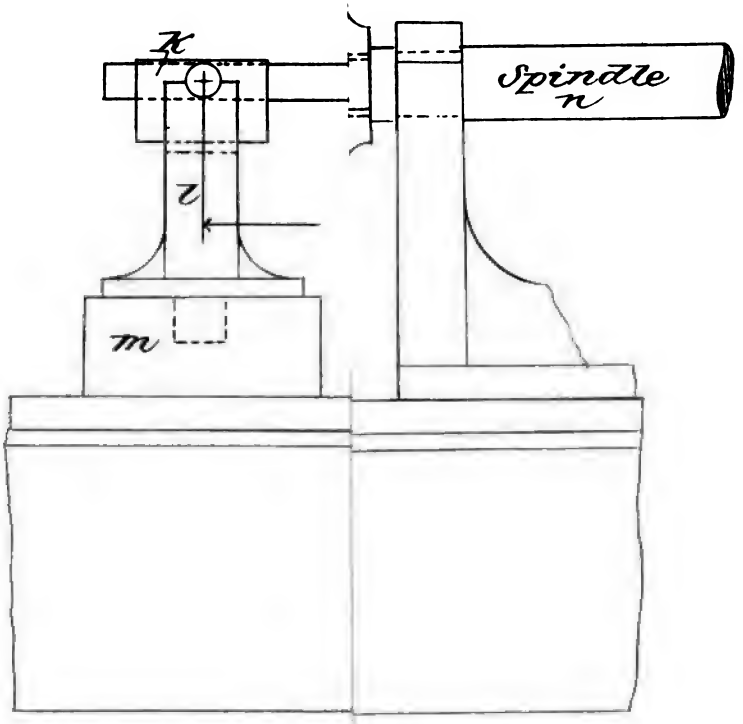
Apparatus.



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ENDURANCE TESTS OF ROTATING SHAFTS.

The tests were made with cylindrical shafts 1 inch diameter, 33 inches long between end bearings, and loaded at the middle.

Two views of the apparatus employed are shown. In the first view, the end elevation, *a* is the experimental shaft, *b* a loose bronze flanged ring made to accommodate the friction wheels *c*, which have 1-inch faces. The bearing of ring *b* on the experimental shaft is one-half inch long.

d is a weighted lever used to apply the load to the experimental shaft; it carries the friction wheels *c*.

One end of the lever is carried by stud *e*. The lever is forked to receive the head of the stud, which latter has an eye elongated in a longitudinal direction, through which passes a cylindrical connecting pin. The object of the elongated eye being to provide freedom of movement of the lever in a horizontal direction, so that the experimental shaft should be loaded in a vertical direction, unrestrained by the apparatus.

By means of nuts at the lower end of the stud its height may be adjusted and the lever kept in a horizontal position under the different loads on the shaft.

The lever is weighted at end carrying hook *f*; the weight being suspended by a short piece of hemp rope.

The long and short arms of the lever are 30″ and 9″.8, respectively, thus giving the ratio 3.0612.

The weight applied to the shaft, due to the weight of the lever and its attachments and the bronze ring, was 40¾ pounds.

A guide strap encircling the shaft on the side of the lever towards the head or driving end was fastened to the top of the lever at *h*. This guide strap was to catch the head end of the shaft after rupture and prevent injury to the apparatus before its rotations could be stopped.

In the view showing the longitudinal elevation, *a* is the experimental shaft and *b* the bronze flanged ring, the same as shown in the other view; *n* is the driving spindle which carries the ball-and-socket chuck *j*.

The shaft is screwed into the ball *i*; a helical spring *o* keeps the ball in contact with the cap of the chuck. Spindle *n* is driven by a belt. A dog on the shaft engages with projections on the face of the chuck and secures the same number of rotations of the spindle and shaft.

The number of rotations was indicated by a counter attached to the opposite end of the spindle.

The other end of the experimental shaft runs in a babbitted box *k*, which was mounted on trunnions. Intermediate piece *l* has the trunnion bearings at its upper end; the lower end rests upon and has a pivot bearing in beam *m*.

Beam *m* is supported by the sides of the bed *g*. Bed *g* and spindle *n* and its bearings belonged to an engine lathe which was fittted up for the purpose of making these tests.

The working of the apparatus proved satisfactory on the whole, although not possessing all the advantageous features which might be embodied in a machine of special design and construction.

It was desired to relieve the experimental shaft so far as practicable of other than the principal transverse stresses, and to have a measure of these stresses.

The maximum fiber stress due the static load on the middle of the shaft is that stress recorded in the table of results, and it is believed the actual stress in each case where the load did not materially exceed the elastic limit of the metal was not largely augmented by reason of vibration of the weighted lever and the torsional stress of driving the shaft.

Shafts loaded with a fiber stress of 25,000 pounds per square inch or higher, ran with less tendency toward vibration of the lever than when under lighter loads.

It was found expedient under the lighter loads to use check nuts above the lever on the stud *r* to restrict the vibrations within a few thousandths of an inch at this place.

In the ordinary running of the apparatus it is believed that the fiber stress did not vary from the recorded stress more than 300 pounds per square inch, due to vibration of the lever. In many cases this maximum was not reached.

The torsional stress due the friction of the shaft in the bearing *k* and of the wheels *c* was not sufficient when the shafts were lightly loaded to keep the dog at the ball and socket end in the position of being driven by the projections on the chuck *j*.

The paradoxical behavior was observed of the tendency of the shaft to gain on the speed of the spindle, bringing the dog into the position of driving the chuck instead of being driven by it.

The rate at which this acceleration has been observed would cause the shaft to gain 1 turn in about 150 turns of the spindle.

This peculiarity has been explained as being due to the friction between the surfaces of the ball *i* and the cap of the chuck *j*, while the axes of the spindle and the deflected shaft are not in the same straight line.

When the shafts are higher loaded, 25,000 pounds per square inch and upwards, this peculiar tendency disappears.

It is not unlikely that the vibration of the lever when the shaft is running under light loads, is influenced in part by the action of the ball and socket joint, and in part by the lacing of the driving belt striking the pulley of the spindle.

Before commencing a test three gauged lengths of 10 inches each were laid off on the shaft symmetrical with the middle bearing, 120 degrees apart on the circumference.

Observations on these lengths were made after rupture, and at intervals during the progress of some of the experiments.

Deflections were measured on chords of 10 inches each, using the same lines which were laid off as gauged lengths, and which are designated in the results of the tests by the letters *a*, *b*, and *c*; each deflection being measured when the designated line was on the under or convex side of the shaft.

The deflection measurements were made by means of a screw micrometer mounted on a beam at the middle of its length. The beam was provided with supporting hooks 10 inches apart which enabled the instrument to be suspended below the shaft, with the micrometer under the middle bearing.

When measurements were being taken the bronze ring *h* was replaced by a semi-cylindrical ring on which the weighted lever rested, through the intervening friction wheels, which thus allowed the micrometer

make contact with the under side of the shaft. This semi-cylindrical ring had one-half inch length of bearing on the shaft, the same as the bronze ring.

The usual manner of taking the deflection measurements was to make observations on one line, first taking a micrometer reading with the shaft unloaded, then loaded, and finally unloaded; and so doing on the other two chords.

The actual micrometer readings are recorded in the tables of results; the deflections and deflection sets are deduced from them.

If the first and third readings are the same, there is no appreciable set. The difference between the second and the third readings is recorded as the deflection. It is the deflection of the loaded bar divested of the set, or strictly the resilience of the bar.

Different speeds of rotation were used; most of the bars were run at 400 rotations per minute, others at 700 per minute, and one bar at 1,350 per minute.

The ruptures of several bars were not completed by the rotating test; evidences of failure being apparent the tests were discontinued, and afterwards tests made by tension in a longitudinal direction.

Attention was directed to the acquisition of data touching upon the behavior of the different grades of metal subjected to different treatment prior to the time of rupture, as well as determining the total number of repetitions of loads necessary to cause rupture.

The formula for the fiber stress of cylindrical shafts supported at the ends loaded at the middle is

$$R = \frac{Pl}{\pi r^3}$$

The treatment and behavior of each shaft will be described separately, preceding the details of the test.

TEST NO. 1.—*O. H. steel bar, marked* 1-833.

This shaft was turned down from a hot-rolled bar 1¼ inches diameter, and from the same lot of steel used in the temperature tests, and otherwise experimented upon as recorded in Report of Tests, 1887.

The original tensile test of this grade of steel gave the following results from a bar turned down to 1″.0092 diameter by 32″ length of stem:

Elastic limit per square inch	pounds..	30,000
Tensile strength per square inch	do....	52,475
Elongation after fracture	per cent..	23.6
Contraction of area	do....	61.5
Appearance of fracture		silky.

In this test a slight set was detected after a load of 10,000 pounds per square inch. It was ″.0001 in the gauged length of 30 inches. The sets increased with higher loads, and at 30,000 pounds per square inch reached ″.0022. Under the following load, 30,500 pounds per square inch, the metal yielded rapidly, increasing the elongation under stress from ″.0307 to ″.1480.

This extract from the original test is given to emphasize the difference in results displayed by the metal when once loaded to rupture, and when ruptured by repeated stresses; and also to show that, while according to the ordinary methods of making tensile tests, it has been customary to admit slight sets within the elastic limit of the metal, but which sets appear to have an important influence on the endurance of the metal under repeated stresses, according to the light of present experience.

It is not yet shown, however, that rupture may be effected by repeated stresses, when the stresses are confined within the limit of perfect elasticity, as it existed before the commencement of the loadings, granting there is a limit within which the restoration of the metal is complete upon removal of the stress.

The shaft was first loaded with 20,000 pounds per square inch fiber stress.

The micrometer readings showed a deflection of ".0146 on each of the lines *a*, *b*, and *c* measured on a chord of 10", and sets of ".0002, ".0001, and ".0002, respectively.

After 50,000 rotations the bar was measured again with the results shown in the details, which are nearly the same as the first set of readings.

When differences of measurements are confined to ".0001 it may be doubted whether at times instrumental or personal error is not the cause of the difference.

After 200,000 rotations the fiber stress was increased to 21,000 pounds per square inch. The deflections were measured after 50,000 rotations were made under this load, which showed deflections of ".0153 to ".0154, the sets remaining substantially as before.

After running under this stress the load was increased to 22,000 pounds per square inch, and measurements taken at intervals, and so continuing under higher stresses. At 24,000 pounds per square inch the sets appear to increase, unquestionably so at 25,000 pounds per square inch.

Under a fiber stress of 27,000 pounds per square inch the bar was rotated 13,000 times, then followed a period of rest, and then the completion of the run to 50,000 turns under this load, making in all 1,450,000 rotations.

Now the sets have reached considerable magnitude, and it will be observed that the sets at the close of the run of 1,500,000 total rotations were ".0002, ".0014, and ".0010, and after the shaft rested 15 hours the repeated measurements gave ".0004, ".0005, and ".0002; the maximum set after the rest being ".0005 against ".0014 before the rest.

This effect of rest on the metal after it has been loaded, and large sets introduced, is fully illustrated in this series of experiments. The effect of the shorter period of rest of 1 hour is not apparent, but the rest of 15½ hours after the shaft had been loaded with 28,000 pounds per square inch, shows a conspicuous change in the sets.

After 50,000 rotations had been made under this load the measurements were twice taken, and again twice after the rest of 15½ hours, for the purpose of confirming the indications first shown.

After permanent sets are introduced repeated measurements will not be the same, necessarily; much will depend upon the position of the load on the shaft when rotation ceases, with reference to the line of measurements first taken.

Continuing under the same load, when the total number of rotations had reached 1,800,000, the micrometer readings were taken three times before and three times after a rest of 39½ hours, with the same results before noted.

Taking the mean deflections of all the readings, it appears that the deflection is less after than before the rest. The change, however, is too slight to be fully relied upon as a fact.

The comparatively small part of the shaft which is overstrained makes the identification of changes in its properties difficult. The similarity in behavior of these shafts to metal overstrained by direct tensi assists materially in understanding some of the observed phenomen

Under 29,000 pounds per square inch, and after a total run of 1,950,000 turns, the shaft rested 15 hours; and here we observed a decided reduction in both the sets and the deflections.

Soon after this it was noticed that a decided rise in the temperature of the bar occurred, hence it is not improbable that some increase in temperature may have occurred before the shaft rested on this occasion; and under such circumstances the stiffening of the shaft may be due to two causes, the change in temperature and the period of rest, both of which, direct tensile tests have shown, tend to restore the modulus of elasticity after it has been temporarily lowered.

After loading with 30,000 pounds per square inch measurements were taken at more frequent intervals; then followed a rest of 8 days 7 hours, and after resting observations were again made at frequent intervals.

The maximum set found, before resting, under this load was ".0049; after the long rest the first set of readings showed a maximum set of ".0011.

When rotated the sets at once increased; at least, after 1,000 turns the maximum set was ".0021, which was increased to ".0023 and then to ".0029 after succeeding runs. Then followed another rest of 15 hours after a total run of 2,115,000 turns.

After this rest the sets were reduced, but increased after rotating and soon reached ".0033, and then ".0040 after a total run of 2,200,000 turns. No material difference in the deflections, however, occurred in the mean time. The load was increased to 31,000 pounds per square inch, which largely increased the sets.

A rest of 15 hours diminished the sets and also the deflections from the mean ".0234 to ".0224, the total run now being 2,250,000 turns. At this time the surface of the shaft in the vicinity of the middle bearing was carefully inspected microscopically; no evidence of incipient cracks was detected.

The phenomena previously described were repeated after the rotations were resumed. After making 2,402,000 rotations the shaft rested 18 days; this rest caused a large reduction in the sets, but not so marked a difference in the deflections.

After completing 2,502,000 rotations the fiber stress was reduced to 30,000 pounds per square inch, and a further reduction made to 20,000 pounds per square inch after completing 2,633,000 rotations.

The vibration of the shaft was now considerable, the movement being about ".02. After running for a time under 20,000, 21,000, and 22,000 pounds per square inch, when the total number of rotations reached 3,033,500, the shaft increased its wabbling motion rapidly.

It was stopped rotating and examined; a crack ".55 from the middle of the shaft was in sight and could be followed through 140 degrees of arc on the side included by lines *a* and *b*.

The rupture of the shaft was afterward completed by tensile stress in a longitudinal direction, and the extent of the crack shown to extend through about 185 degrees.

The deflections and sets now measured showed irregularity in each not heretofore observed.

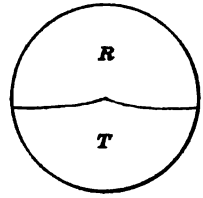
That part of the cross-section of the shaft, about 53 per cent. of the total area, which was ruptured by transverse stress while rotating, had a dull leaden appearance with a smooth surface. The part ruptured by direct tension was granular.

The approximate area of the bar ruptured by direct tension was

.37 square inch, and the load required 17,680 pounds, which equals 47,780 pounds per square inch.

This strength is not submitted as evidence necessarily of loss in tenacity of the metal; a sharp crack extending more than one-half through the shaft would, from its presence, tend to reduce the apparent tenacity of the remaining metal.

End view of fractured shaft.



Section ruptured while rotating marked R; section ruptured by direct tensile stress marked T.

No. 1.—*O. H. steel bar*, 1–833.

Diameter, 1″. Speed of rotation, 400 per minute. Distance between end bearings, 33″. Deflections measured on chord of 10 inches.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
20,000	0	0	*a*	.2006	.1858	.2004	.0146	.0002	
			b	.2006	.1859	.2005	.0146	.0001	
			c	.2007	.1859	.2005	.0146	.0002	
									Rotated 20,000 times, then rested 16 hours unloaded.
20,000	50,000	50,000	*a*	.2005	.1858	.2004	.0146	.0001	
			b	.2006	.1859	.2005	.0146	.0001	
			c	.2006	.1859	.2006	.0147	0.	
									Rotated 46,400 times, then rested 1 hour unloaded.
20,000	50,000	100,000	*a*	.2005	.1858	.2005	.0147	0.	
			b	.2006	.1859	.2005	.0146	.0001	
			c	.2006	.1859	.2005	.0146	.0001	
20,000	50,000	150,000	*a*	.2006	.1859	.2004	.0145	.0002	
			b	.2006	.1859	.2005	.0146	.0001	
			c	.2006	.1859	.2005	.0146	.0001	
									Rotated 13,000 times, then rested 16 hours unloaded.
20,000	50,000	200,000	*a*	.2005	.1860	.2005	.0145	0.	
			b	.2006	.1859	.2005	.0146	.0001	
			c	.2006	.1859	.2005	.0146	.0001	
21,000									Rotated 48,000 times, then rested 1 hour unloaded.
21,000	50,000	250,000	*a*	.2003	.1850	.2003	.0153	0.	
			b	.2006	.1852	.2005	.0153	.0001	
			c	.2006	.1851	.2005	.0154	.0001	
21,000	50,000	300,000	*a*	.2005	.1851	.2004	.0153	.0001	
			b	.2006	.1853	.2006	.0153	0.	
			c	.2006	.1851	.2005	.0154	.0001	
									Rotated 31,163 times, then rested 16 hours unloaded.
21,000	50,000	350,000	*a*	.2006	.1852	.2005	.0153	.0001	
			b	.2007	.1852	.2009	.0154	.0001	
			c	.2007	.1852	.2005	.0153	.0002	
21,000	50,000	400,000	*a*	.2004	.1852	.2004	.0152	0.	
			b	.2006	.1852	.2005	.0153	.0001	
			c	.2006	.1852	.2005	.0153	.0001	
22,000									Rotated 15,300 times, then rested 1 hour unloaded.

No. 1.—*O. H. steel bar;* 1-833—Continued.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
22,000	50,000	450,000	*a*	.2005	.1843	.2004	.0161	.0001	
			b	.2007	.1847	.2006	.0159	.0001	
			c	.2006	.1845	.2005	.0160	.0001	
22,000	50,000	500,000	*a*	.2005	.1845	.2004	.0159	.0001	
			b	.2006	.1845	.2005	.0160	.0001	
			c	.2006	.1844	.2005	.0161	.0001	
22,000	50,000	550,000	*a*	.2007	.1845	.2005	.0160	.0002	Rested 15 hours unloaded.
			b	.2007	.1846	.2006	.0160	.0001	
			c	.2007	.1846	.2006	.0160	.0001	
22,000	50,000	600,000	*a*	.2004	.1845	.2004	.0159	0.	Rotated 38,000 times, then rested 1 hour unloaded.
			b	.2006	.1845	.2005	.0160	.0001	
			c	.2006	.1845	.2005	.0160	.0001	
23,000	50,000	650,000	*a*	.2006	.1838	.2005	.0167	.0001	Surface of bar scored at middle bearing. Diameter filed down to original size.
			b	.2007	.1839	.2006	.0167	.0001	
			c	.2009	.1840	.2007	.0167	.0002	
23,000	50,000	700,000	*a*	.2007	.1840	.2007	.0167	0.	Rotated 18,000 times, then rested 15 hours unloaded.
			b	.2009	.1840	.2008	.0168	.0001	
			c	.2009	.1840	.2008	.0168	.0001	
23,000	50,000	750,000	*a*	.2008	.1840	.2007	.0167	.0001	
			b	.2009	.1840	.2008	.0168	.0001	
			c	.2008	.1840	.2007	.0167	.0001	
23,000	50,000	800,000	*a*	.2008	.1839	.2007	.0168	.0001	Rotated 2,000 times, then rested 1 hour unloaded.
			b	.2009	.1840	.2008	.0168	.0001	
			c	.2008	.1839	.2007	.0168	.0001	
24,000	.....	.....	.....	.....	.....	.....	.....	.....	Rotated 38,548 times, then rested 39 hours unloaded.
24,000	50,000	850,000	*a*	.2008	.1830	.2007	.0177	.0001	
			b	.2009	.1831	.2008	.0177	.0001	
			c	.2010	.1831	.2008	0177	.0002	

24,000	50,000	900,000	*a*	.2009	.1828	.2007	.0179	.0002	
			b	.2009	.1832	.2007	.0175	.0002	
			c	.2008	.1828	.2007	.0179	.0001	
24,000	50,000	950,000	*a*	.2006	.1827	.2005	.0178	.0001	Rotated 14,700 times, then rested 1 hour unloaded.
			b	.2008	.1828	.2007	.0179	.0001	
			c	.2009	.1829	.2008	.0179	.0001	
24,000	50,000	1,000,000	*a*	.2007	.1828	.2006	.0178	.0001	Rotated 48,200 times, then rested 15 hours.
			b	.2010	.1829	.2008	.0179	.0002	
			c	.2010	.1832	.2008	.0176	.0002	
25,000	50,000	1,050,000	*a*	.2006	.1821	.2006	.0185	0.	
			b	.2009	.1821	.2008	.0187	.0001	
			c	.2011	.1822	.2008	.0186	.0003	
25,000	50,000	1,100,000	*a*	.2007	.1821	.2005	.0184	.0002	Rotated 32,000 times, then rested 1 hour unloaded.
			b	.2008	.1820	.2007	.0187	.0001	
			c	.2010	.1822	.2008	.0186	.0002	
25,000	50,000	1,150,000	*a*	.2008	.1822	.2007	.0185	.0001	
			b	.2012	.1822	.2008	.0186	.0004	
			c	.2011	.1820	.2007	.0187	.0004	
25,000	50,000	1,200,000	*a*	.2007	.1821	.2007	.0186	0.	Rotated 15,000 times, then rested 15 hours unloaded.
			b	.2012	.1823	.2007	.0184	.0005	
			c	.2012	.1822	.2008	.0186	.0004	
25,000	50,000	1,250,000	*a*	.2009	.1820	.2006	.0186	.0003	Rested 1 hour unloaded.
			b	.2010	.1822	.2007	.0185	.0003	
			c	.2012	.1822	.2007	.0185	.0005	
26,000	50,000	1,300,000	*a*	.2008	.1816	.2006	.0190	.0002	
			b	.2009	.1817	.2005	.0188	.0004	
			c	.2013	.1816	.2007	.0191	.0006	
26,000	50,000	1,350,000	*a*	.2008	.1814	.2005	.0191	.0003	Rotated 29,500 times, then rested 15 hours unloaded.
			b	.2010	.1815	.2006	.0191	.0004	
			c	.2014	.1817	.2007	.0190	.0007	
26,000	50,000	1,400,000	*a*	.2009	.1815	.2005	.0190	.0004	
			b	.2007	.1816	.2006	.0190	.0001	
			c	.2014	.1816	.2006	.0190	.0008	
27,000									Rotated 13,000 times, then rested 1 hour.
27,000	50,000	1,450,000	*a*	.2007	.1804	.2002	.0198	.0005	
			b	.2008	.1804	.2002	.0198	.0006	
			c	.2016	.1807	.2004	.0197	.0012	

No. 1.—*O. H. steel bar*, 1-833—Continued.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
27,000	50,000	1,500,000	*a*	.2004	.1802	.2002	.0200	.0002	
			b	.2018	.1807	.2004	.0197	.0014	
			c	.2015	.1806	.2005	.0199	.0010	
27,000	0	1,500,000	*a*	.2013	.1813	.2009	.0196	.0004	Rested 15 hours unloaded.
			b	.2013	.1810	.2008	.0198	.0005	
			c	.2009	.1808	.2007	.0199	.0002	
27,000	50,000	1,550,000	*a*	.2009	.1805	.2002	.0197	.0007	
			b	.2008	.1803	.2002	.0199	.0006	
			c	.2017	.1806	.2005	.0199	.0012	
27,000	50,000	1,600,000	*a*	.2001	.1801	.2000	.0199	.0001	Rotated 35,000 times, then rested 1 hour.
			b	.2012	.1803	.2003	.0200	.0009	
			c	.2017	.1806	.2005	.0199	.0012	
28,000	50,000	1,650,000	*a*	.2005	.1793	.2000	.0207	.0005	
			b	.2021	.1797	.2001	.0204	.0020	
			c	.2017	.1797	.2003	.0206	.0014	
28,000	0	1,650,000	*a*	.2015	.1798	.2002	.0204	.0013	
			b	.2016	.1795	.2002	.0207	.0014	
			c	.2017	.1797	.2003	.0206	.0014	
28,000	0	1,650,000	*a*	.2016	.1803	.2007	.0201	.0009	Rested 15½ hours unloaded.
			b	.2014	.1802	.2006	.0204	.0008	
			c	.2012	.1800	.2005	.0205	.0007	
28,000	0	1,650,000	*a*	.2016	.1803	.2007	.0204	.0009	
			b	.2015	.1800	.2005	.0205	.0010	
			c	.2014	.1800	.2005	.0205	.0009	
28,000	50,000	1,700,000	*a*	.2012	.1795	.2000	.0205	.0012	
			b	.2018	.1797	.2002	.0205	.0016	
			c	.2016	.1796	.2003	.0207	.0013	
000	50,000	1,750,000	*a*	.2019	.1793	.2000	.0207	.0019	Rotated 30,800 times, then rested 1 hour.
			b	2015	.1795	.2001	.0206	.0014	
			c	.2017	.1796	.2002	.0206	.0015	

28,000	50,000	1,800,000	*a*	.2020	.1724	.2000	.0206	.0020	
			b	.2017	.1795	.2002	.0207	.0015	
			c	.2017	.1797	.2003	.0206	.0014	
28,000	0	1,800,000	*a*	.2018	.1796	.2002	.0206	.0016	
			b	.2017	.1797	.2000	.0203	.0017	
			c	.2016	.1798	.2003	.0205	.0013	
28,000	0	1,800,000	*a*	.2017	.1795	.2002	.0207	.0015	
			b	.2015	.1796	.2000	.0204	.0015	
			c	.2017	.1798	.2003	.0205	.0014	
28,000	0	1,800,000	*a*	.2015	.1805	.2011	.0206	.0004	Rested 89½ hours unloaded.
			b	.2014	.1804	.2007	.0203	.0007	
			c	.2009	.1799	.2004	.0205	.0005	
28,000	0	1,800,000	*a*	.2017	.1805	.2010	.0205	.0007	
			b	.2013	.1804	.2007	.0203	.0006	
			c	.2010	.1799	.2004	.0205	.0006	
28,000	0	1,800,000	*a*	.2016	.1805	.2009	.0204	.0007	
			b	.2011	.1803	.2006	.0203	.0008	
			c	.2012	.1801	.2004	.0203	.0008	
29,000	50,000	1,850,000	*a*	.2017	.1783	.1996	.0213	.0021	
			b	.2024	.1784	.1998	.0214	.0020	
			c	.2009	.1784	.1998	.0214	.0021	
29,000	50,000	1,900,000	*a*	.2026	.1786	.1998	.0212	.0028	Rotated 21,000 times, then rested 1 hour unloaded.
			b	.2013	.1784	.1997	.0213	.0016	
			c	.2020	.1788	.1999	.0211	.0021	
29,000	50,000	1,950,000	*a*	.2025	.1782	.1998	.0216	.0027	
			b	.2010	.1780	.1995	.0215	.0015	
			c	.2023	.1783	.1999	.0216	.0024	
29,000	0	1,950,000	*a*	.2021	.1797	.2008	.0211	.0013	Rested 15 hours unloaded.
			b	.2016	.1790	.2003	.0213	.0013	
			c	.2011	.1788	.2000	.0212	.0011	
29,000	50,000	2,000,000	*a*	.1999	.1776	.1992	.0216	.0007	
			b	.2010	.1780	.1994	.0214	.0016	
			c	.2029	.1785	.1999	.0214	.0030	
30,000									Decided rise in temperature. Rotated 34,000 times, then rested 1½ hours unloaded.
30,000	50,000	2,050,000	*a*	.2027	.1767	.1988	.0221	.0039	
			b	.2029	.1768	.1992	.0224	.0037	
			c	.2025	.1776	.1994	.0218	.0031	

No. 1.—*O. H. steel bar*, 1-833—Continued.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
30,000	50,000	2,100,000	*a*	.1990	.1761	.1983	.0221	.0008	
			b	.2040	.1769	.1991	.0222	.0049	
			c	.2027	.1774	.1994	.0220	.0033	
30,000	0	2,100,000	*a*	.2022	.1793	.2008	.0215	.0014	Rested 15 hours unloaded.
			b	.2019	.1788	.2004	.0216	.0015	
			c	.2007	.1779	.1996	.0217	.0011	
30,000	5,000	2,105,000	*a*	.2005	.1767	.1987	.0220	.0018	
			b	.2008	.1768	.1998	.0230	.0010	
			c	.2036	.1777	.1995	.0218	.0041	
30,000	5,000	2,110,000	*a*	.1987	.1764	.1983	.0219	.0004	
			b	.2014	.1773	.1991	.0218	.0023	
			c	.2085	.1778	.1997	.0219	.0038	
30,000	0	2,110,000	*a*	.2018	.1792	.2012	.0220	.0001	Shaft removed from machine and allowed to rest a period of 8 days and 7 hours.
			b	.2014	.1788	.2006	.0218	.0008	Shaft again placed in machine after above rest and measured before running again.
			c	.2010	.1778	.1999	.0221	.0011	
30,000	1,000	2,111,000	*a*	.2003	.1783	.2003	.0220	0.	
			b	.2008	.1779	.1999	.0220	.0009	
			c	.2021	.1779	.2000	.0221	.0021	
30,000	1,000	2,112,000	*a*	.2000	.1777	.1998	.0221	.0002	
			b	.2013	.1778	.1998	.0220	.0015	
			c	.2022	.1779	.1999	.0220	.0023	
30,000	3,000	2,115,000	*a*	.2017	.1777	.1998	.0221	.0019	
			b	.2006	.1769	.1993	.0224	.0013	
			c	.2027	.1777	.1998	.0221	.0029	
30,000	0	2,115,000	*a*	.2023	.1791	.2010	.0219	.0013	Rested 15 hours unloaded.
			b	.2018	.1787	.2006	.0219	.0012	
			c	.2010	.1780	.2000	.0220	.0010	
	100	2,115,100	*a*	.2004	.1779	.2002	.0223	.0002	
			b	.2011	.1777	.1998	.0221	.0013	
			c	.2023	.1779	.2000	.0221	.0023	

30,000	100	2,115,200	*a*	.2000	.1777	.2000	.0223	0.
			b	.2013	.1777	.1998	.0221	.0015
			c	.2023	.1778	.2000	.0222	.0023
30,000	300	2,115,500	*a*	.2024	.1779	.2000	.0221	.0024
			b	.2022	.1777	.2000	.0223	.0022
			c	.2019	.1780	.2000	.0220	.0019
30,000	500	2,116,000	*a*	.2003	.1775	.1997	.0222	.0006
			b	.2027	.1777	.1999	.0222	.0028
			c	.2022	.1778	.2000	.0222	.0022
30,000	1,000	2,117,000	*a*	.2027	.1782	.2003	.0221	.0024
			b	.2010	.1777	.1999	.0222	.0011
			c	.2022	.1782	.2002	.0220	.0020
30,000	3,000	2,120,000	*a*	.1998	.1776	.1995	.0219	.0003
			b	.2012	.1776	.1996	.0220	.0016
			c	.2026	.1776	.1998	.0222	.0028
30,000	5,000	2,125,000	*a*	.2015	.1770	.1994	.0224	.0021
			b	.2008	.1771	.1993	.0222	.0015
			c	.2029	.1774	.1997	.0223	.0032
30,000	5,000	2,130,000	*a*	.2020	.1776	.1997	.0221	.0023
			b	.2027	.1776	.1998	.0222	.0029
			c	.2021	.1776	.1997	.0221	.0024
30,000	10,000	2,140,000	*a*	.2015	.1775	.1995	.0220	.0020
			b	.2005	.1765	.1990	.0225	.0015
			c	.2031	.1776	.1998	.0222	.0033
30,000	10,000	2,150,000	*a*	.1996	.1768	.1992	.0224	.0004
			b	.2010	.1770	.1993	.0223	.0017
			c	.2032	.1779	.1999	.0220	.0033
30,000	50,000	2,200,000	*a*	.1999	.1767	.1988	.0221	.0011
			b	.2035	.1776	.1995	.0219	.0040
			c	.2023	.1775	.1997	.0222	.0026
31,000	50,000	2,250,000	*a*	.2032	.1743	.1978	.0235	.0054
			b	.2045	.1754	.1987	.0233	.0058
			c	.2032	.1754	.1987	.0233	.0045
31,000	0	2,250,000	*a*	.2027	.1790	.2014	.0224	.0013
			b	.2023	.1787	.2010	.0223	.0013
			c	.2000	.1762	.1988	.0226	.0012
31,000	100	2,250,100	*a*	.2028	.1773	.1999	.0226	.0029
			b	.2028	.1773	.1999	.0226	.0029
			c	.2017	.1764	.1991	.0227	.0026

Rotated 19,600 times, then rested 1 hour unloaded.

Rested 15 hours unloaded.

No. 1.—*O. H. steel bar*, 1-833—Continued.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
31,000	100	2,250,200	*a*	.1991	.1763	.1960	.0227	.0001	
			b	.2018	.1767	.1994	.0227	.0024	
			c	.2028	.1765	.1992	.0227	.0036	
31,000	300	2,250,500	*a*	.1997	.1761	.1988	.0227	.0009	
			b	.2012	.1763	.1991	.0228	.0021	
			c	.2033	.1764	.1993	.0229	.0040	
31,000	500	2,251,000	*a*	.2024	.1764	.1991	.0227	.0033	
			b	.2034	.1770	.1996	.0226	.0038	
			c	.2022	.1766	.1992	.0226	.0030	
31,000	1,000	2,252,000	*a*	.2026	.1760	.1988	.0228	.0038	Reversed direction of rotation of shaft and run 1,000 turns.
			b	.2004	.1754	.1982	.0228	.0022	
			c	.2041	.1762	.1992	.0230	.0049	
31,000	5,000	2,257,000	*a*	.1990	.1756	.1980	.0224	.0016	
			b	.1998	.1760	.1992	.0232	.0006	
			c	.2028	.1765	.1993	.0228	.0035	
31,000	5,000	2,262,000	*a*	.1979	.1744	.1976	.0232	.0003	
			b	.2019	.1751	.1983	.0232	.0036	
			c	.2040	.1760	.1992	.0232	.0048	
31,000	35,000	2,297,000	*a*	.2035	.1751	.1985	.0234	.0050	
			b	.2004	.1744	.1978	.0234	.0026	
			c	.2042	.1757	.1990	.0233	.0052	
31,000	0	2,297,000	*a*	.2032	.1760	.1991	.0231	.0041	Somewhat warmed. Rested 1½ hours unloaded.
			b	.2028	.1758	.1987	.0229	.0041	
			c	.2031	.1761	.1991	.0230	.0040	
31,000	55,000	2,352,000	*a*	.1993	.1736	.1971	.0235	.0022	
			b	.2008	.1746	.1977	.0231	.0031	
			c	.2053	.1759	.1991	.0232	.0062	
		2,374,000	*a*	.2017	.1742	.1977	.0235	.0040	
			b	.2005	.1738	.1972	.0234	.0033	
			c	.2050	.1757	.1990	.0233	.0060	

Rested 90 hours unloaded.

31,000	0	2,374,000	*a*	.2032	.1794	.2020	.0226	.0012
			b	.2020	.1782	.2008	.0226	.0012
			c	.2002	.1766	.1993	.0227	.0009
31,000	100	2,374,100	*a*	.2025	.1776	.2005	.0229	.0020
			b	.2024	.1769	.1998	.0229	.0026
			c	.2017	.1767	.1994	.0227	.0023
31,000	100	2,374,200	*a*	.2032	.1774	.2003	.0229	.0029
			b	.2014	.1767	.1996	.0229	.0018
			c	.2022	.1768	.1996	.0228	.0026
31,000	300	2,374,500	*a*	.2037	.1771	.2001	.0230	.0036
			b	.2020	.1765	.1994	.0229	.0026
			c	.2024	.1762	.1993	.0231	.0031
31,000	500	2,375,000	*a*	.2037	.1766	.1997	.0231	.0040
			b	.2024	.1763	.1994	.0231	.0030
			c	.2025	.1766	.1993	.0227	.0032
31,000	2,000	2,377,000	*a*	.2035	.1767	.1997	.0230	.0038
			b	.2012	.1758	.1991	.0233	.0021
			c	.2027	.1765	.1993	.0228	.0034
31,000	5,000	2,382,000	*a*	.1990	.1753	.1983	.0230	.0016
			b	.2041	.1759	.1990	.0231	.0051
			c	.2029	.1762	.1991	.0229	.0038
31,000	20,000	2,402,000	*a*	.1980	.1740	.1975	.0235	.0005
			b	.2019	.1752	.1984	.0232	.0035
			c	.2042	.1760	.1991	.0231	.0051
								Shaft removed from machine and allowed to rest a period of 18 days.
31,000	0	2,402,000	*a*	.2032	.1794	.2023	.0229	.0009 } Shaft again placed in machine after above rest and measured before running.
			b	.2018	.1784	.2012	.0228	.0006 }
			c	.1999	.1765	.1994	.0229	.0005 }
31,000	100	2,402,100	*a*	.2031	.1786	.2017	.0231	.0014
			b	.2014	.1777	.2007	.0230	.0007
			c	.2008	.1769	.1997	.0228	.0011
31,000	200	2,402,300	*a*	.2029	.1785	.2014	.0229	.0015
			b	.2013	.1775	.2005	.0230	.0008
			c	.2012	.1768	.1999	.0231	.0013
31,000	200	2,402,500	*a*	.2021	.1781	.2010	.0229	.0011
			b	.2010	.1774	.2002	.0228	.0008
			c	.2018	.1767	.1997	.0230	.0021

No. 10.—*O. H. steel bar*, 1-833—Continued.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
31,000	500	2,403,000	*a*	.2012	.1777	.2006	.0229	.0006	
			b	.2025	.1776	.2003	.0227	.0022	
			c	.2015	.1766	.1997	.0231	.0018	
31,000	1,000	2,404,000	*a*	.2023	.1772	.2004	.0232	.0019	
			b	.2010	.1767	.1997	.0230	.0013	
			c	.2023	.1767	.1997	.0230	.0026	
31,000	1,000	2,405,000	*a*	.2010	.1768	.2000	.0232	.0010	
			b	.2013	.1765	.1998	.0233	.0015	
			c	.2027	.1769	.1998	.0229	.0029	
31,000	2,000	2,407,000	*a*	.2034	.1773	.2003	.0230	.0031	
			b	.2017	.1770	.1999	.0229	.0018	
			c	.2019	.1764	.1996	.0232	.0023	
31,000	5,000	2,412,000	*a*	.2000	.1759	.1994	.0235	.0006	
			b	.2034	.1762	.1996	.0234	.0038	
			c	.2025	.1766	.1995	.0229	.0030	
31,000	5,000	2,417,000	*a*	.2015	.1756	.1990	.0234	.0025	
			b	.2010	.1757	.1990	.0233	.0020	
			c	.2036	.1764	.1996	.0232	.0040	
31,000	5,000	2,422,000	*a*	.2010	.1757	.1990	.0233	.0020	
			b	.2000	.1755	.1988	.0233	.0021	
			c	.2039	.1764	.1995	.0231	.0044	
31,000	.....	.....	.....	.....	.....	.....	.....	.....	Rotated 9,000 times, then rested 1 hour unloaded.
31,000	10,000	2,432,000	*a*	.2036	.1762	.1994	.0232	.0042	
			b	.2030	.1765	.1995	.0230	.0035	
			c	.2027	.1761	.1994	.0233	.0033	
31,000	20,000	2,452,000	*a*	.2001	.1751	.1983	.0234	.0016	
			b	.2012	.1750	.1985	.0235	.0027	
			c	.2043	.1762	.1994	.0232	.0049	
	50,000	2,502,000	*a*	.1976	.1738	.1974	.0236	.0002	
			b	.2020	.1754	.1986	.0232	.0039	
			c	.2045	.1763	.1994	.0231	.0051	
									Rested 1½ hours unloaded.

31,000	0	2,502,000	*a*	.2028	.1785	.2014	.0229	.0014	
			b	.2023	.1780	.2008	.0228	.0015	
			c	.2007	.1766	.1995	.0229	.0012	
30,000	0	2,502,000	*a*	.2025	.1787	.2011	.0224	.0014	Fiber stress reduced to 30,000 pounds per square inch and measurements taken before running.
			b	.2012	.1780	.2003	.0223	.0009	
			c	.2015	.1772	.1997	.0225	.0018	
30,000	50,000	2,552,000	*a*	.1981	.1752	.1976	.0224	.0005	
			b	.2028	.1766	.1989	.0223	.0039	
			c	.2035	.1768	.1994	.0226	.0041	
30,000	0	2,552,000	*a*	.2024	.1769	.1993	.0224	.0031	Rested 1 hour unloaded.
			b	.2026	.1770	.1993	.0223	.0033	
			c	.2026	.1769	.1994	.0225	.0032	
30,000	50,000	2,602,000	*a*	.1984	.1751	.1978	.0227	.0006	
			b	.2037	.1767	.1991	.0224	.0046	
			c	.2032	.1770	.1994	.0224	.0038	
30,000	31,000	2,633,000	*a*	.2038	.1764	.1991	.0227	.0047	
			b	.2015	.1764	.1990	.0226	.0025	
			c	.2029	.1766	.1993	.0227	.0036	
30,000	0	2,633,000	*a*	.2026	.1797	.2018	.0221	.0008	Rested 39 hours unloaded.
			b	.2016	.1786	.2008	.0222	.0008	
			c	.2002	.1771	.1994	.0223	.0008	
20,000	69,000	2,702,000	*a*	.2020	.1873	.2020	.0147	0.	Shaft vibrates badly; movement at middle about ".02.
			b	.2011	.1862	.2010	.0148	.0001	
			c	.2001	.1851	.1998	.0147	.0003	
20,000									Rotated 19,000 times, then rested 1 hour unloaded.
20,000	50,000	2,752,000	*a*	.2023	.1872	.2020	.0148	.0003	
			b	.2012	.1862	.2010	.0148	.0002	
			c	.2001	.1850	.1998	.0148	.0003	
20,000	50,000	2,802,000	*a*	.2022	.1872	.2021	.0149	.0001	
			b	.2011	.1862	.2009	.0147	.0002	
			c	.2002	.1851	.1999	.0148	.0003	
20,000									Rotated 8,000 times, then rested 15 hours unloaded.
20,000	50,000	2,852,000	*a*	.2022	.1873	.2021	.0148	.0001	
			b	.2011	.1861	.2010	.0149	.0001	
			c	.2002	.1852	.2000	.0148	.0002	
21,000	50,000	2,902,000	*a*	.2022	.1866	.2020	.0154	.0002	
			b	.2010	.1852	.2009	.0157	.0001	
			c	.2003	.1844	.2001	.0157	.0002	

No. 1.—*O. H. steel bar*, 1–833—Continued.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
21,000	50,000	2,952,000	*a*	.2023	.1865	.2021	.0156	.0002	
			b	.2010	.1851	.2009	.0158	.0001	
			c	.2002	.1845	.2001	.0156	.0001	
22,000									Rotated 39,000 times, then rested 15 hours unloaded.
22,000	50,000	3,002,000	*a*	.2019	.1854	.2019	.0165	0.	
			b	.2011	.1839	.2008	.0169	.0003	
			c	.2006	.1839	.2003	.0164	.0003	
22,000	33,500	3,035,500							Shaft ruptured. Shaft increased its wabbling motion rapidly; its rotation was stopped. It was then examined and a crack found extending around 140°, including the lines *a* and *b*. The crack was ".55 from the middle of the length of the shaft towards the ball and socket end. The following deflections were then measured.
22,000	0	3,035,500	*a*	.1956	.1716	.1918	.0202	.0038	
			b	.1996	.1715	.1921	.0206	.0075	
			c	.2157	.1843	.2054	.0211	.0103	
22,000	0	3,035,500	*a*	.1989	.1716	.1921	.0205	.0068	
			b	.1983	.1718	.1924	.0206	.0059	
			c	.2157	.1841	.2056	.0215	.0101	

TEST NO. 2.—*O. H. steel bar, marked* 2–123.

Turned down from bar 1¼″ diameter. The original tensile test of the metal was as follows:

Elastic limit per square inch	pounds	39,500
Tensile strength per square inch	do	68,375
Elongation in 30 inches	per cent	21.2
Contraction of area	do	49.1
Appearance of fracture		silky

The shaft was at once loaded with a fiber stress of 35,857 pounds per square inch. Although this load was below the elastic limit as established for the tensile test, yet from its behavior it was evidently affected by sets of greater or less magnitude.

The observations on the shaft were not so complete as in some other tests. The first reading taken with the micrometer was when the shaft was unloaded, then after it was loaded; hence the deflections here shown include the sets, which account for the irregularities displayed.

The temperature of the shaft rose to about 110° Fahr., and remained there during the latter part of the test, at the close of which the shaft wabbled considerably.

Soon after this behavior was observed the test was discontinued and the bar examined. A fine crack was in sight, extending through about 100 degrees of arc.

The gauged lengths as originally laid off on the surface of the shaft, and as now measured after the crack appeared, were as follows:

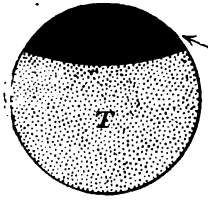
Line.	Gauged lengths.		Differences.
	Original.	Final.	
	Inches.	*Inches.*	*Inches.*
a	10.0055	10.0060	.0005
b	10.0039	10.0045	.0006
c	9.9937	9.9920	—.0017

The mean difference indicates a shortening of ″.0002, which may be due to the bent condition of the shaft.

Rupture was reached without the development of the ductility displayed by the tensile test.

The fracture was completed by tensile stress applied in a longitudinal direction with the following results:

Tensile strength, 24,980 pounds=42,700 pounds per square inch on the section unruptured by the rotating test.



Section fractured by transverse stress while rotating.
Dull leaden color.

The section marked T was fractured by tensile stress applied in a longitudinal direction. Appearance, fine granular.

Approximate area of granular section, .585 square inch.

No. 2.—*O. H. steel bar*, 2–123.

Diameter, 1″. Speed of rotation, 400 per minute. Distance between end bearings, 33″. Deflections measured on chord of 10 inches.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*		
35,857	0	0	*a*	.1997	.1728	.....	.0269	.....	
			b	.2001	.1738	.....	.0263	.....	
			c	.2000	.1736	.....	.0264	.....	
35,857	55,000	55,000	*a*	.1998	.1682	.....	.0316	.....	
			b	.1958	.1668	.....	.0290	.....	
			c	.2029	.1680	.....	.0349	.....	
35,857	0	55,000	*a*	.1998	.1683	.....	.0315	.....	Bar rested 40 hours unloaded.
			b	.2008	.1689	.....	.0319	.....	
			c	.1997	.1674	.....	.0323	.....	
35,857	45,000	100,000	*a*	.1984	.1664	.....	.0320	.....	
			b	.1956	.1675	.....	.0281	.....	
			c	.2031	.1663	.....	.0368	.....	
35,857	50,000	150,000	*a*	.1958	.1666	.....	.0292	.....	
			b	.1979	.1675	.....	0304	.....	
			c	.2035	.1650	.....	0385	.....	
35,857	50,000	200,000	*a*	.2034	.1672	.....	.0362	.....	
			b	.1991	.1645	.....	.0346	.....	
			c	.1944	.1657	.....	.0287	.....	
35,857	297,100	497,100	.....	.....	.....	.....	.....	.....	Bar fractured.

TEST NO. 3.—*Second O. H. steel bar, marked* 2–123.

The speed of rotation of this shaft was 700 turns per minute.

Under 25,000 pounds per square inch fiber stress, ".0001 set was observed in some cases; in others no sets appeared.

Under 26,000 pounds per square inch, and succeeding higher loads, sets appeared and increased with the loads.

Until experiments are more numerous it will be difficult to understand the comparative effect of loads augmented at intervals, as many of this series are tested, and of constant loads on the endurance of the metal.

With 29,000 pounds per square inch fiber stress, and 450,000 total number of rotations, measurements were taken for the purpose of determining whether the shaft deflected the same amount while running at full speed as it did when slowly turned.

A micrometer was mounted on a cross-bar below the shaft close by the bronze ring at the middle bearing, and readings taken measuring to the under side of the shaft.

From these readings it appeared that the deflection of the shaft was less at full speed than while slowly turned. The difference shown at this time was ".0010.

The difference in deflections measured in this manner refers to the total length of the shaft, 33 inches, and not to a chord of 10 inches.

Subsequent measurements taken on this shaft in some cases showed a greater difference, reaching ".0030, and in several instances there was no appreciable difference.

In the tests of other bars which follow, results were obtained which dispel the doubts arising from the results obtained with this shaft, and from which it appears that the deflections tend to diminish under high speeds of rotation when the loads exceed the elastic limit of the metal, and tend to cause permanent sets; but, on the other hand, when the elastic limit is not passed the deflections are the same within the range of speeds yet experimented with.

The elastic limit referred to in this connection is considered the limit within which no appreciable sets occur under the conditions of a transverse load on a rotating shaft.

One set of observations was made when the shaft was loaded with 33,000 pounds per square inch, total number of rotations 800,000, which showed a deflection ".0040 greater with the shaft slowly rotated than at full speed; measurements repeated after another run of 50,000 turns showed no difference, and it is believed this anomalous result was reached through some error.

There was a decided increase in the temperature of the shaft observed at 650,000 total number of rotations, which had increased to about 100° Fahr. when 750,000 rotations were reached.

The effect of rest on the deflections and sets, common to this and other shafts already commented upon, will be passed by without special remark.

No. 3.—*Second O. H. steel bar*, 2–123.

Diameter, 1″. Speed of rotation, 700 per minute. Distance between end bearings, 33″. Deflections measured on chord of 10 inches.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	Inch.	
25,000	0	0	*a*	.1989	.1804	.1989	.0185	0.	
			b	.1989	.1809	.1989	.0180	0.	
			c	.1988	.1803	.1988	.0185	0.	
25,000	20,000	20,000	*a*	.1989	.1804	.1989	.0185	0.	
			b	.1990	.1804	.1989	.0185	.0001	
			c	.1988	.1803	.1988	.0185	0.	
25,000	30,000	50,000	*a*	.1989	.1804	.1989	.0185	0.	Rested 39 hours unloaded.
			b	.1989	.1805	.1989	.0184	0.	
			c	.1989	.1803	.1989	.0186	0.	
25,000	50,000	100,000	*a*	.1989	.1804	.1989	.0185	0.	
			b	.1990	.1804	.1989	.0185	.0001	
			c	.1989	.1804	.1988	.0184	.0001	
26,000	50,000	150,000	*a*	.1988	.1796	.1988	.0192	0.	
			b	.1991	.1796	.1989	.0193	.0002	
			c	.1990	.1794	.1987	.0196	.0003	
26,000	50,000	200,000	*a*	.1990	.1795	.1987	.0192	.0003	
			b	.1990	.1797	.1988	.0191	.0002	
			c	.1990	.1796	.1987	.0191	.0003	
27,000	50,000	250,000	*a*	.1992	.1786	.1987	.0201	.0005	
			b	.1991	.1787	.1986	.0199	.0005	
			c	.1991	.1787	.1985	.0198	.0006	
27,000									Rotated 32,000 turns, then rested 15 hours unloaded.
27,000	50,000	300,000	*a*	.1992	.1788	.1986	.0198	.0006	
			b	.1992	.1788	.1987	.0199	.0005	
			c	.1990	.1786	.1985	.0199	.0005	
		350,000	*a*	.1984	.1778	.1984	.0206	0.	
			b	.1980	.1779	.1986	.0207	.0004	
			c	.1982	.1779	.1985	.0206	.0003	

28,000	50,000	400,000	*a*	.1983	.1775	.1983	.0206	0.	
			b	.1992	.1775	.1984	.0209	.0008	
			c	.1994	.1776	.1983	.0207	.0011	
29,000	50,000	450,000	*a*	.1997	.1767	.1983	.0216	.0014	
			b	.1993	.1769	.1983	.0214	.0010	
			c	.1993	.1769	.1982	.0213	.0011	
29,000	50,000	500,000	*a*	.1979	.1764	.1977	.0213	.0002	
			b	.1995	.1766	.1981	.0215	.0014	
			c	.1994	.1765	.1980	.0215	.0014	
30,000	0	500,000	*a*	.1994	.1758	.1980	.0222	.0014	
			b	.1995	.1760	.1981	.0221	.0014	
			c	.1994	.1756	.1979	.0223	.0015	
30,000	50,000	550,000	*a*	.1975	.1749	.1972	.0223	.0003	
			b	.1995	.1753	.1978	.0225	.0017	
			c	.2000	.1754	.1978	.0224	.0022	
30,000	0	550,000	*a*	.1997	.1769	.1987	.0218	.0010	Rested 15 hours unloaded.
			b	.1994	.1767	.1986	.0219	.0008	
			c	.1987	.1763	.1979	.0216	.0008	
30,000	50,000	600,000	*a*	.1989	.1753	.1975	.0222	.0014	
			b	.2004	.1757	.1979	.0222	.0025	
			c	.1996	.1755	.1977	.0222	.0019	
31,000	0	600,000	*a*	.1997	.1747	.1977	.0230	.0020	
			b	.1997	.1752	.1979	.0227	.0018	
			c	.1997	.1747	.1977	.0230	.0020	
31,000	50,000	650,000	*a*	.1987	.1741	.1970	.0229	.0017	
			b	.1985	.1739	.1971	.0232	.0014	
			c	.2009	.1746	.1975	.0229	.0034	
31,000	50,000	700,000	*a*	.1966	.1733	.1965	.0232	.0001	
			b	.1993	.1739	.1972	.0233	.0021	
			c	.2010	.1742	.1974	.0232	.0036	
32,000	0	700,000	*a*	.1996	.1733	.1972	.0239	.0026	
			b	.2002	.1735	.1974	.0239	.0028	
			c	.2002	.1734	.1973	.0239	.0029	
32,000	50,000	750,000	*a*	.1991	.1724	.1965	.0241	.0026	
			b	.1985	.1724	.1966	.0242	.0019	
			c	.2014	.1733	.1970	.0237	.0044	
32,000	50,000	800,000	*a*	.2003	.1724	.1966	.0242	.0037	
			b	.1986	.1725	.1966	.0241	.0020	
			c	.2011	.1731	.1970	.0239	.0041	Rested 15 hours unloaded.

No. 3.—*Second O. H. steel bar*, 2-123—Continued.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
32,000	0	800,000	*a*	.2004	.1753	.1986	.0233	.0018	
			b	.1999	.1746	.1981	.0235	.0018	
			c	.1989	.1736	.1972	.0236	.0017	
33,000	0	800,000	*a*	.2004	.1736	.1981	.0245	.0023	
			b	.2000	.1732	.1977	.0245	.0023	
			c	.1995	.1728	.1971	.0243	.0024	
33,000	50,000	850,000	*a*	.2022	.1711	.1964	.0253	.0058	
			b	.1995	.1716	.1965	.0249	.0030	
			c	.2010	.1715	.1965	.0250	.0045	
33,000	50,000	900,000	*a*	.1991	.17 9	.1960	.0251	.0031	
			b	.2019	.1720	.1969	.0249	.0050	
			c	.2006	.1715	.1965	.0250	.0041	
34,000	0	900,000	*a*	.2006	.1707	.1964	.0257	.0042	
			b	.2009	.1711	.1967	.0256	.0042	
			c	.2009	.1708	.1965	.0257	.0044	
34,000	50,000	950,000	*a*	.1972	.1690	.1951	.0261	.0021	
			b	.2029	.1705	.1964	.0259	.0065	
			c	.2011	.1703	.1960	.0257	.0051	
34,000	50,000	1,000,000	*a*	.2033	.1704	.1962	.0258	.0071	
			b	.2009	.1708	.1963	.0255	.0046	
			c	.2009	.1703	.1960	.0257	.0049	
35,000	0	1,000,000	*a*	.2012	.1698	.1960	.0262	.0052	
			b	.2014	.1702	.1964	.0262	.0050	
			c	.2010	.1699	.1961	.0262	.0049	
35,000	33,000	1,033,000	*a*	.1974	.1676	.1944	.0268	.0030	
			b	.1984	.1683	.1947	.0264	.0037	
			c	.2039	.1696	.1961	.0265	.0078	
35,000	0	1,033,000	*a*	.2013	.1728	.1961	.0253	.0032	Rested 15 hours unloaded.
			b	.2005	.1715	.1978	.0258	.0022	
			c	.1994	.1705	.1964	.0259	.0030	

35,000	17,000	1,050,000	*a*	.1966	.1671	.1941	.0270	.0015	
			b	.2035	.1693	.1959	.0266	.0076	
			c	.2018	.1692	.1959	.0267	.0050	
35,000	50,000	1,100,000	*a*	.2038	.1687	.1953	.0268	.0083	
			b	.2013	.1691	.1959	.0268	.0054	
			c	.2013	.1693	.1958	.0265	.0055	
36,000	0	1,100,000	*a*	.2015	.1678	.1953	.0275	.0062	
			b	.2016	.1683	.1957	.0274	.0059	
			c	.2018	.1678	.1955	.0277	.0063	
36,000	50,000	1,150,000	*a*	.2045	.1667	.1948	.0281	.0097	
			b	.2022	.1677	.1954	.0277	.0068	
			c	.2016	.1671	.1950	.0279	.0066	Reeled 1½ hours unloaded.
36,000	0	1,150,000	*a*	.2020	.1688	.1960	.0272	.0060	
			b	.2018	.1689	.1961	.0272	.0057	
			c	.2010	.1681	.1955	.0274	.0055	
36,000	50,000	1,200,000	*a*	.1984	.1652	.1931	.0279	.0003	
			b	.1984	.1670	.1942	.0272	.0042	
			c	.2047	.1686	.1959	.0273	.0088	
37,000	0	1,200,000	*a*	.2013	.1660	.1947	.0287	.0066	
			b	.2014	.1667	.1951	.0284	.0063	
			c	.2024	.1673	.1956	.0283	.0068	
37,000	13,400	1,213,400	.....	.....	.....	.....	.....	.....	Bar ruptured.

TEST NO. 4.—*O. H. steel bar, marked* 3–782.

Turned down from a bar 1¼″ diameter. The original tensile test gave the following results:

Elastic limit per square inch	pounds	46,500
Tensile strength per square inch	do	80,000
Elongation in 30 inches	per cent	13.0
Contraction of area	do	43.5
Appearance of fracture		silky

The micrometer readings, taken prior to, and when the total run of 600,000 rotations was reached, only included readings first when the shaft was unloaded and then when loaded; therefore the deflections deduced include whatever sets there may have been.

After 650,000 rotations the readings were taken in the usual manner.

The gauged lengths were measured after 450,000 rotations and again after 1,100,000 rotations, with the following results:

Lines.	Total number of rotations.		Differences.
	450,000.	1,100,000.	
	Inches.	*Inches.*	*Inch.*
a	10.0028	10.0027	.0001
b	9.9848	9.9847	.0001
c	9.9972	9.9968	.0004

After completing 2,100,000 rotations the shaft was examined, but no cracks were detected.

After the load was increased to 43,000 pounds per square inch and the bar had made 23,000 additional turns there was a decided rise in temperature.

Water was used to cool it during the next 4,000 turns, after which the shaft was allowed to regain a higher temperature. It reached about 110° Fahr., when the total run of 2,130,000 turns was reached.

The deflections were immediately measured, then the shaft was cooled with water to 74° Fahr., and measured twice. Next followed a period of rest of 15 hours, then measurements taken; the shaft remaining at about 74° Fahr. The shaft was then heated along the middle of its length about the same temperature it had acquired while running, 110° Fahr.

After the first cooling there was a decided reduction in the deflections, and when reheated the increase is thought to be sufficiently marked to attribute the change to the heating.

The extent of the surface ruptured at the close of the rotating test and the completion of the rupture by tensile stress follows:

Fractured suddenly without warning.

Tensile strength, 18,210 pounds = 46,690 pounds per square inch on the section unruptured by rotating test.

Section fractured by transverse stress whe rotating.
Dull leaden color.

Section marked T was fractured by tensile stress applied in a lon tudinal direction. Appearance, fine granular.

Approximate area of granular section, .39 square inch.

No. 4.—*O. H. steel bar*, 3–782.

Diameter, 1″. Speed of rotation, 400 per minute. Distance between end bearings, 33″. Deflections measured on chord of 10 inches.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
35,857	100,000	100,000	*a*	.1998	.1729	.....	.0269	.....	
			b	.1998	.1728	.....	.0270	.....	
			c	.2005	.1728	.....	.0277	.....	
35,857	50,000	150,000	*a*	.1996	.1728	.....	.0268	.....	
			b	.2000	.1724	.....	.0276	.....	
			c	.2004	.1725	.....	.0279	.....	
									Rested 15 hours unloaded.
35,857	50,000	200,000	*a*	.1999	.1728	.....	.0271	.....	
			b	.1995	.1722	.....	.0277	.....	
			c	.2003	.1726	.....	.0277	.....	
35,857	50,000	250,000	*a*	.1993	.1732	.....	.0266	.....	
			b	.1999	.1724	.....	.0275	.....	
			c	.2007	.1731	.....	.0276	.....	
									Rested 15 hours unloaded.
35,857	50,000	300,000	*a*	.2000	.1731	.....	.0269	.....	
			b	.1998	.1727	.....	.0271	.....	
			c	.2006	.1726	.....	.0280	.....	
35,857	50,000	350,000	*a*	.1998	.1727	.....	.0271	.....	
			b	.1998	.1722	.....	.0276	.....	
			c	.2007	.1723	.....	.0284	.....	
35,857	50,000	400,000	*a*	.1998	.1726	.....	.0272	.....	
			b	.1996	.1726	.....	.0270	.....	
			c	.2008	.1723	.....	.0285	.....	
35,857	.....	.....	.....	.....	.....	.....	.....	.....	Rotated 34,300 times, then rested 15 hours unloaded.
35,857	50,000	450,000	*a*	.2006	.1727	.....	.0279	.....	
			b	.2003	.1724	.....	.0279	.....	
			c	.1995	.1726	.....	.0269	.....	
35,857	50,000	500,000	*a*	.2003	.1727	.....	.0276	.....	
			b	.2004	.1721	.....	.0283	.....	
			c	.1995	.1725	.....	.0270	.....	

No. 4.—*O. H. steel bar*, 3-782—Continued.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
35,857	50,000	550,000	*a*	.1994	.1727	.....	.0267	.....	
			b	.1995	.1732	.....	.0263	.....	
			c	.1996	.1732	.....	.0264	.....	
35,857	50,000	600,000	*a*	.1994	.1727	.....	.0267	.....	
			b	.1995	.1732	.....	.0263	.....	
			c	.1996	.1732	.....	.0264	.....	
35,857	50,000	650,000	*a*	.1995	.1731	.1995	.0264	0.	
			b	.2001	.1731	.1995	.0264	.0006	
			c	.2007	.1732	.1997	.0265	.0010	
35,857	50,000	700,000	*a*	.1995	.1729	.1995	.0266	0.	
			b	.2003	.1732	.1995	.0263	.0008	
			c	.2008	.1732	.1997	.0265	.0011	
35,857	50,000	750,000	*a*	.1997	.1731	.1997	.0266	0.	
			b	.2002	.1728	.1995	.0267	.0007	
			c	.2007	.1730	.1997	.0267	.0010	
35,857	50,000	800,000	*a*	.1995	.1730	.1995	.0265	0.	
			b	.2003	.1730	.1995	.0265	.0008	
			c	.2007	.1729	.1996	.0267	.0011	
35,857	50,000	850,000	*a*	.1997	.1730	.1997	.0267	0.	Rested 39 hours unloaded.
			b	.2002	.1730	.1996	.0266	.0006	
			c	.2007	.1731	.1997	.0266	.0010	
35,857	50,000	900,000	*a*	.2005	.1729	.1997	.0268	.0008	
			b	.2007	.1731	.1996	.0265	.0011	
			c	.2005	.1731	.1997	.0266	.0008	
35,857	50,000	950,000	*a*	.1996	.1729	.1996	.0267	.0002	
			b	.2001	.1728	.1995	.0267	.0006	
			c	.2007	.1731	.1997	.0266	.0010	
35,857	50,000	1,000,000	*a*	.2000	.1730	.1997	.0267	.0003	Rested 15 hours unloaded.
			b	.2007	.1731	.1997	.0266	.0010	
			c	.2005	.1731	.1997	.0266	.0008	

35,857	50,000	1,050,000	a	.1995	.1732	.1995	.0263	0.	
			b	.2004	.1730	.1995	.0265	.0009	
			c	.2007	.1732	.1997	.0265	.0010	
35,857	50,000	1,100,000	a	.2008	.1732	.1997	.0265	.0011	
			b	.2005	.1732	.1997	.0265	.0008	
			c	.2003	.1732	.1997	.0265	.0008	
38,000	0	1,100,000	a	.2008	.1728	.2004	.0276	.0004	Bar removed from machine and rested 32 days and 17 hours.
			b	.2004	.1722	.2001	.0279	.0003	
			c	.2002	.1719	.1998	.0279	.0004	
38,000	50,000	1,150,000	a	.2004	.1717	.1998	.0281	.0006	
			b	.2009	.1716	.1998	.0282	.0011	
			c	.2006	.1721	.1997	.0276	.0009	
38,000	50,000	1,200,000	a	.2003	.1717	.1998	.0281	.0005	
			b	.2010	.1717	.1997	.0280	.0013	
			c	.2007	.1717	.1997	.0280	.0010	
38,000	50,000	1,250,000	a	.1997	.1714	.1995	.0281	.0002	Rotated 20,000 times, then rested 15 hours unloaded.
			b	.2009	.1717	.1996	.0279	.0012	
			c	.2010	.1717	.1997	.0280	.0013	
38,000	50,000	1,300,000	a	.2005	.1714	.1997	.0283	.0008	
			b	.2010	.1714	.1997	.0283	.0013	
			c	.2008	.1713	.1997	.0284	.0011	
38,000	0	1,300,000	a	.2009	.1717	.1998	.0281	.0011	Rested 1 hour unloaded.
			b	.2007	.1715	.1997	.0282	.0010	
			c	.2008	.1717	.1997	.0280	.0011	
39,000	50,000	1,350,000	a	.2008	.1705	.1994	.0289	.0014	
			b	.2003	.1703	.1992	.0289	.0011	
			c	.2013	.1707	.1995	.0288	.0018	
39,000	50,000	1,400,000	a	.1995	.1703	.1992	.0289	.0003	Rotated 20,000 times, then rested 15 hours unloaded.
			b	.2013	.1705	.1994	.0289	.0019	
			c	.2011	.1709	.1996	.0287	.0015	
39,000	50,000	1,450,000	a	.2012	.1706	.1995	.0289	.0017	
			b	.2004	.1705	.1994	.0289	.0010	
			c	.2011	.1706	.1996	.0296	.0015	
39,000	50,000	1,500,000	a	.2013	.1707	.1995	.0288	.0018	
			b	.2003	.1702	.1992	.0290	.0011	
			c	.2012	.1705	.1995	.0290	.0017	
40,000									Rotated 30,000 times, then rested 15 hours unloaded.
40,000	50,000	1,550,000	a	.2017	.1697	.1994	.0297	.0023	
			b	.2004	.1692	.1990	.0298	.0014	
			c	.2012	.1694	.1993	.0290	.0019	

No. 4.—*O. H. steel bar*, 3-782—Continued.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
40,000	50,000	1,600,000	*a*	.2007	.1694	.1991	.0297	.0016	
			b	.2002	.1694	.1988	.0294	.0014	
			c	.2018	.1698	.1993	.0295	.0025	
40,000	50,000	1,650,000	*a*	.1999	.1690	.1987	.0297	.0002	
			b	.2008	.1692	.1990	.0298	.0018	
			c	.2015	.1694	.1992	.0298	.0023	
40,000	50,000	1,700,000	*a*	.2019	.1694	.1992	.0298	.0027	
			b	.2000	.1692	.1991	.0299	.0009	
			c	.2013	.1692	.1992	.0300	.0021	
40,000	0	1,700,000	*a*	.2013	.1708	.2002	.0294	.0011	Rested 39 hours unloaded.
			b	.2009	.1702	.1997	.0295	.0012	
			c	.2005	.1699	.1993	.0294	.0012	
40,000	1,000	1,701,000	*a*	.2009	.1699	.1994	.0295	.0015	
			b	.2002	.1694	.1991	.0297	.0011	
			c	.2004	.1697	.1994	.0297	.0020	
40,000	1,000	1,702,000	*a*	.2014	.1698	.1993	.0295	.0021	
			b	.2012	.1695	.1992	.0297	.0020	
			c	.2011	.1698	.1993	.0295	.0018	
41,000	48,000	1,750,000	*a*	.2022	.1688	.1992	.0304	.0030	
			b	.2003	.1681	.1988	.0305	.0017	
			c	.2014	.1696	.1991	.0305	.0023	
41,000	50,000	1,800,000	*a*	.2018	.1682	.1990	.0308	.0028	
			b	.2002	.1678	.1985	.0307	.0017	
			c	.2015	.1687	.1989	.0302	.0026	
41,000	50,000	1,850,000	*a*	.1992	.1675	.1985	.0310	.0007	
			b	.2021	.1683	.1988	.0305	.0033	
			c	.2015	.1681	.1989	.0308	.0026	
41,000	0	1,850,000	*a*	.2014	.1691	.1985	.0304	.0019	Rested 15 hours unloaded.
			b	.2013	.1690	.1991	.0301	.0022	
			c	.2011	.1685	.1990	.0305	.0021	

41,000	50,000	1,900,000	*a*	.1998	.1677	.1985	.0308	.0013	
			b	.2000	.1679	.1984	.0305	.0016	
			c	.2021	.1684	.1990	.0306	.0031	
42,000	50,000	1,950,000	*a*	.1999	.1668	.1982	.0314	.0017	
			b	.2023	.1671	.1985	.0314	.0038	
			c	.2014	.1673	.1986	.0313	.0028	
42,000	50,000	2,000,000	*a*	.2028	.1671	.1987	.0316	.0041	
			b	.2010	.1670	.1983	.0313	.0027	
			c	.2017	.1670	.1986	.0316	.0031	
42,000	0	2,000,000	*a*	.2018	.1682	.1992	.0310	.0026	Rested 15 hours unloaded.
			b	.2015	.1677	.1988	.0311	.0027	
			c	.2013	.1676	.1988	.0312	.0025	
42,000	50,000	2,050,000	*a*	.2012	.1669	.1983	.0314	.0029	
			b	.2022	.1674	.1987	.0313	.0035	
			c	.2017	.1674	.1988	.0314	.0029	
42,000	50,000	2,100,000	*a*	.2033	.1668	.1982	.0319	.0051	
			b	.2003	.1667	.1982	.0315	.0021	
			c	.2026	.1676	.1988	.0312	.0038	
43,000	30,000	2,130,000	*a*	.2017	.1652	.1980	.0328	.0037	Temperature of bar, 110° Fahr.
			b	.1997	.1648	.1973	.0325	.0024	
			c	.2032	.1661	.1984	.0328	.0048	
43,000	0	2,130,000	*a*	.2023	.1665	.1985	.0320	.0038	Temperature of bar, 74° Fahr.
			b	.2021	.1663	.1978	.0315	.0043	
			c	.2020	.1667	.1986	.0319	.0034	
43,000	0	2,130,000	*a*	.2022	.1667	.1987	.0320	.0035	Temperature of bar, 74° Fahr.
			b	.2016	.1664	.1982	.0318	.0034	
			c	.2020	.1665	.1986	.0321	.0034	
43,000	0	2,130,000	*a*	.2020	.1673	.1991	.0318	.0029	Rested 15 hours unloaded. Temperature of bar, about 74° Fahr.
			b	.2016	.1672	.1986	.0314	.0030	
			c	.2016	.1668	.1987	.0319	.0029	
43,000	0	2,130,000	*a*	.2017	.1680	.2004	.0324	.0013	Middle of bar heated to about 110° Fahr.
			b	.2011	.1676	.1996	.0320	.0015	
			c	.2002	.1666	.1988	.0322	.0014	
43,000	20,000	2,150,000	*a*	.2006	.1663	.1985	.0322	.0023	
			b	.2024	.1663	.1985	.0322	.0039	
			c	.2015	.1662	.1985	.0323	.0030	
43,000	42,000	2,193,000	*a*	.1982	.1657	.1982	.0325	0.	
			b	.2003	.1659	.1980	.0321	.0023	
			c	.2028	.1667	.1987	.0320	.0041	Rested 1 hour unloaded.

No. 4.—*O. H. steel bar*, 3-782—Continued.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
43,000	0	2,192,000	*a*	.2020	.1666	.1988	.0322	.0032	
			b	.2016	.1665	.1986	.0321	.0030	
			c	.2018	.1671	.1988	.0317	.0030	
43,000	41,160	2,233,160	.....	.....	.....	.....	.....	.....	Bar ruptured.

TEST NO. 5.—*O. H. steel bar, marked 4–795.*

Turned down from a bar $1\frac{1}{4}''$ diameter.

The original tensile test gave the following results:

Elastic limit per square inch	pounds..	50,000
Tensile strength per square inch	do....	85,160
Elongation in 30 inches	per cent..	17.5
Contraction of area	do....	45.3
Appearance of fracture		silky

Decided sets appeared under 34,000 pounds per square inch fiber stress, and increased in magnitude under the higher loads.

The loads were increased in regular increments of 2,000 pounds until 48,000 pounds per square inch and the total run of 920,000 rotations was reached; at this time the test was discontinued, and the shaft afterward ruptured by direct tensile stress in a longitudinal direction.

The object in view being to ascertain what change in the tensile properties had been effected by repeated transverse stresses before those stresses had approached their ultimate limit. Tensile tests of steel shafts which have cracks in an advanced stage of development are not satisfactory for this purpose.

The tensile test of this shaft showed an elastic limit lower than the original test, the tensile strength slightly higher. It might have shown higher still had the fracture not been located by the drilled and countersunk hole defining one extremity of a gauged length.

However, it is demonstrated that the effect of the repeated stresses had not at the close of the test sensibly diminished the tenacity of the shaft at the middle of its length, where the transverse stresses reach their maximum.

That the ductility was disturbed is shown by cracks on the surface of the shaft in the vicinity of the middle bearing, their development being assisted no doubt by the tool marks left by the lathe-turning tool.

TENSILE TEST OF SHAFT NO. 5, AFTER EXPOSED TO REPEATED STRESSES.

Diameter, 1″.

Sectional area, .7854 square inch.

Approximate elastic limit, 36,700 pounds = 46,730 pounds per square inch.

Tensile strength, 68,100 pounds = 86,710 pounds per square inch.

Fractured at drilled and counter-sunk hole, defining one extremity of 10″ gauged length. Appearance, silky, 50 per cent. of the surface being interspersed with fine granulation.

At the middle of the bar for a length of three-fourths of an inch the surface, after the tensile test, was broken in numerous places by short transverse cracks. These cracks started at tool marks in the surface of the bar, which were not removed by filing when the bar was finished.

Elongation in 10 inches, 1″.64 = 16.4 per cent.

Elongation of inch sections, ″.36*, ″.20, ″.17, ″.13, ″.12, ″.14, ″.11, ″.12, ″.14, ″.15.

Diameter at fracture, ″.83. Area, .541 square inch.

Contraction, 31.1 per cent.

No. 5.—*O. H. steel bar*, 4–795.

Diameter, 1″. Speed of rotation, 400 per minute. Distance between end bearings, 33″. Deflections measured on chord of 10 inches.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
30,000	0	0	*a*	.2003	.1779	.2003	.0224	0.	
			b	.2003	.1778	.2002	.0224	.0001	
			c	.2003	.1779	.2003	.0224	0.	
30,000	50,000	50,000	*a*	.2004	.1780	.2003	.0223	.0001	
			b	.2004	.1780	.2003	.0223	.0001	
			c	.2004	.1779	.2003	.0224	.0001	
30,000	50,000	100,000	*a*	.2004	.1780	.2003	.0223	.0001	
			b	.2004	.1783	.2003	.0223	.0001	
			c	.2004	.1781	.2003	.0222	.0001	
32,000									Rotated 16,500 times, then rested 15 hours unloaded.
32,000	50,000	150,000	*a*	.2006	.1766	.2005	.0239	.0001	
			b	.2005	.1766	.2005	.0239	0.	
			c	.2005	.1767	.2005	.0238	0.	
32,000	50,000	200,000	*a*	.2007	.1766	.2006	.0240	.0001	
			b	.2006	.1769	.2005	.0236	.0001	
			c	.2006	.1767	.2005	.0238	.0001	
34,000	50,000	250,000	*a*	.2009	.1753	.2006	.0258	.0003	
			b	.2007	.1754	.2005	.0251	.0002	
			c	.2006	.1753	.2004	.0251	.0002	
34,000									Rotated 44,000 times, then rested 15 hours unloaded.
34,000	50,000	300,000	*a*	.2006	.1753	.2006	.0253	0.	
			b	.2008	.1753	.2005	.0252	.0003	
			c	.2007	.1756	.2005	.0249	.0002	
36,000	50,000	350,000	*a*	.2010	.1733	.2004	.0271	.0006	
			b	.2006	.1740	.2004	.0264	.0002	
			c	.2008	.1740	.2004	.0264	.0004	

38,000	50,000	400,000	a	.2006	.1735	.2003	.0268	.0003	
			b	.2008	.1735	.2003	.0268	.0005	
			c	.2008	.1735	.2004	.0269	.0004	
38,000	50,000	450,000	a	.2012	.1717	.2002	.0285	.0010	
			b	.2007	.1719	.2002	.0283	.0005	
			c	.2010	.1721	.2000	.0289	.0010	
38,000	50,000	500,000	a	.2003	.1716	.2001	.0285	.0002	Rotated 15,000 times, then rested 15 hours unloaded.
			b	.2007	.1720	.2002	.0282	.0005	
			c	.2011	.1719	.2002	.0283	.0009	
40,000	50,000	550,000	a	.2001	.1697	.1997	.0300	.0004	
			b	.2016	.1703	.2000	.0297	.0016	
			c	.2013	.1703	.2000	.0297	.0013	
40,000	.....	550,000	a	.2012	.1702	.2000	.0298	.0012	Rested 1 hour unloaded.
			b	.2012	.1708	.2001	.0293	.0011	
			c	.2013	.1699	.2000	.0301	.0013	
40,000	50,000	600,000	a	.2005	.1699	.1998	.0299	.0007	
			b	.2016	.1703	.2001	.0298	.0015	
			c	.2013	.1703	.2000	.0298	.0013	
42,000	.....	.....	.....	.....	.....	.....	.....	.....	Rotated 35,000 times, then rested 15 hours unloaded.
42,000	50,000	650,000	a	.1994	.1675	.1992	.0317	.0002	
			b	.2010	.1680	.1995	.0315	.0015	
			c	.2020	.1684	.1999	.0315	.0021	
42,000	50,000	700,000	a	.2005	.1680	.1995	.0315	.0010	
			b	.2020	.1684	.1997	.0313	.0023	
			c	.2015	.1686	.1998	.0312	.0017	
44,000	50,000	750,000	a	.2026	.1658	.1992	.0334	.0034	
			b	.2008	.1659	.1990	.0331	.0018	
			c	.2023	.1669	.1995	.0326	.0028	
44,000	55,940	805,940	a	.2005	.1655	.1988	.0333	.0017	
			b	.2025	.1665	.1993	.0327	.0033	
			c	.2022	.1656	.1992	.0336	.0030	
44,000	0	805,940	a	.2019	.1673	.1997	.0324	.0022	Rested 15 hours unloaded.
			b	.2019	.1671	.1996	.0325	.0023	
			c	.2017	.1665	.1994	.0329	.0023	
46,000	44,060	850,000	a	.2038	.1636	.1987	.0351	.0051	
			b	.2013	.1641	.1985	.0344	.0028	
			c	.2029	.1646	.1990	.0344	.0039	
46,000	50,000	900,000	a	.2035	.1637	.1986	.0349	.0049	
			b	.2009	.1635	.1984	.0349	.0025	
			c	.2030	.1646	.1991	.0345	.0039	

No. 5.—*O. H. steel bar*, 4–795—Continued.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
48,000	20,000	920,000	*a*	.2000	.1614	.1970	.0366	.0030	
			b	.2049	.1617	.1980	.0363	.0039	
			c	.2034	.1623	.1982	.0362	.0052	Test discontinued. Shaft afterward ruptured by tensile stress.

TEST NO. 6.—*O. H. steel bar, marked* 5–803.

Turned down from a bar 1¼″ diameter.

The original tensile test of the metal gave the following results:

Elastic limit per square inch	pounds..	58,000
Tensile strength per square inch	do ...	98,760
Elongation in 30 inches	per cent..	14.9
Contraction of area	do ...	41.6
Appearance of fracture	silky; interspersed with fine granulation	

This shaft run at the speed of 1,350 rotations per minute.

Beginning with a fiber stress of 30,000 pounds per square inch the load was increased to 40,000 pounds per square inch, and then to 50,000 pounds per square inch, after successive runs of 10,000 turns each. Under the latter stress the shaft became sensibly warmer, and at the close of 46,300 total rotations had reached a temperature of about 110° Fahr. This load also caused an increase in the sets.

The maximum set and mean deflection are diminished after a rest of 15 hours. Resuming the test the shaft acquired nearly the same temperature as before. Increasing the stress to 55,000 pounds per square inch there was a rapid rise in temperature, which reached about 200° Fahr. at the close of 150,000 rotations, and was still hotter when the shaft was loaded with 60,000 pounds per square inch and had made 190,000 rotations. Its estimated temperature was then about 250° Fahr.

Water was used to cool the shaft to 75° Fahr. The measurements taken after cooling showed smaller sets; otherwise no material change.

Near the close of the test, after 230,000 rotations, there appeared an unusually large difference in the deflections on the several lines, the deflection on line *a* being ″.0467 against ″.045 on line *c*.

Rupture occurred at 239,000 rotations. The fracture of the shaft was complete; the surface was smooth and undulating, except at the center, where there was a longitudinal crack, causing an offset in the surface.

The milder grades of metal usually give sufficient warning by reason of the excessive vibration of the weighted lever to allow the rotations to be stopped before rupture extends across the shaft; the higher grades of metal fracture suddenly, with little or no warning.

Observations were made on the total deflection of the shaft slowly turned around and at full speed, taken with a micrometer mounted on a cross-bar below the shaft as previously described.

When the test began the shaft apparently deflected ″.0040 less at full speed than when slowly rotated. After 10,000 rotations the observed difference was ″.0020, but when the load was increased to 40,000 pounds per square inch there was no appreciable difference, measurements being taken when this load was first applied, and again after a total run of 20,000 rotations.

No. 6.—*O. H. steel bar*, 5–803.

Diameter, 1″. Speed of rotation, 1,350 per minute. Distance between end bearings, 33″. Deflections measured on chord of 10 inches.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
30,000	0	0	*a*	.1997	.1775	.1997	.0222	0.	
			b	.1991	.1767	.1991	.0224	0.	
			c	.1987	.1765	.1987	.0222	0.	
30,000	10,000	10,000	*a*	.1997	.1772	.1997	.0225	0.	
			b	.1991	.1768	.1991	.0223	0.	
			c	.1988	.1763	.1987	.0224	.0001	
40,000	0	10,000	*a*	.1997	.1702	.1997	.0295	0.	
			b	.1991	.1692	.1990	.0298	.0001	
			c	.1988	.1689	.1987	.0298	.0001	
40,000	10,000	20,000	*a*	.1998	.1703	.1997	.0294	.0001	
			b	.1991	.1697	.1991	.0294	0.	
			c	.1989	.1689	.1987	.0298	.0002	
50,000	0	20,000	*a*	.1997	.1617	.1995	.0378	.0002	
			b	.1992	.1617	.1990	.0378	.0002	
			c	.1990	.1613	.1987	.0374	.0003	
50,000	26,300	46,300	*a*	.1980	.1597	.1976	.0379	.0004	Temperature increased.
			b	.2008	.1598	.1975	.0377	.0033	Temperature about 110° Fahr.
			c	.2002	.1600	.1977	.0377	.0025	
50,000	0	46,300	*a*	.2007	.1617	.1987	.0370	.0020	Rested 15 hours unloaded.
			b	.1999	.1608	.1980	.0372	.0019	
			c	.1998	.1604	.1979	.0375	.0019	
50,000	13,700	60,000	*a*	.2002	.1610	.1983	.0373	.0019	
			b	.1985	.1603	.1974	.0371	.0011	
			c	.2007	.1601	.1979	.0378	.0028	
50,000	10,000	70,000	*a*	.2005	.1605	.1983	.0378	.0022	
			b	.1987	.1596	.1973	.0377	.0014	
			c	.2006	.1605	.1980	.0375	.0026	

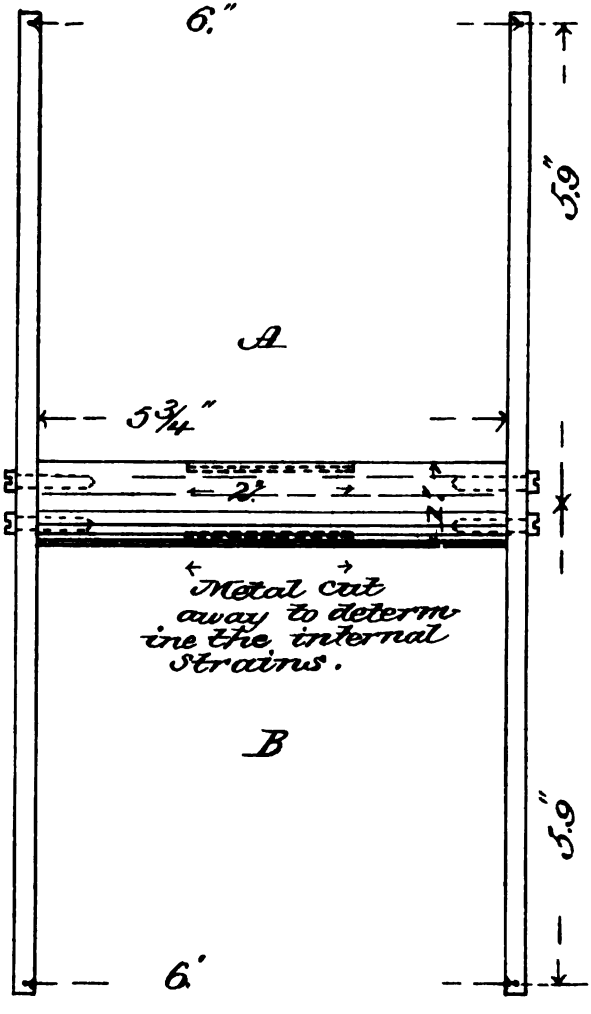
50,000	10,000	80,000	*a*	.1982	.1598	.1979	.0381	.0003	
			b	.2007	.1601	.1976	.0375	.0031	
			c	.2003	.1607	.1979	.0372	.0024	
50,000	10,000	90,000	*a*	.1978	.1601	.1976	.0375	.0002	
			b	.1905	.1601	.1974	.0373	.0021	Temperature about 100° Fahr.
			c	.2007	.1605	.1980	.0375	.0027	
50,000	10,000	100,000	*a*	.2005	.1603	.1982	.0379	.0023	
			b	.1986	.1600	.1973	.0373	.0013	
			c	.2007	.1600	.1979	.0379	.0028	
50,000	10,000	110,000	*a*	.2014	.1603	.1984	.0381	.0030	
			b	.1992	.1601	.1976	.0375	.0016	
			c	.2001	.1608	.1980	.0372	.0021	
50,000	10,000	120,000	*a*	.2010	.1604	.1982	.0378	.0028	
			b	.2003	.1604	.1979	.0375	.0024	
			c	.2001	.1605	.1979	.0374	.0022	
50,000	10,000	130,000	*a*	.1993	.1603	.1981	.0378	.0012	
			b	.2006	.1599	.1978	.0379	.0028	
			c	.2000	.1603	.1978	.0375	.0022	
50,000	10,000	140,000	*a*	.2010	.1604	.1983	.0379	.0027	
			b	.1989	.1600	.1975	.0375	.0014	
			c	.2003	.1603	.1980	.0377	.0023	
									Rested 1 hour unloaded
50,000	0	140,000	*a*	.2008	.1613	.1987	.0374	.0021	
			b	.1999	.1604	.1979	.0375	.0020	
			c	.2002	.1605	.1981	.0376	.0021	
55,000	0	140,000	*a*	.2007	.1568	.1981	.0413	.0026	
			b	.2001	.1563	.1975	.0412	.0026	
			c	.2006	.1568	.1977	.0409	.0029	
55,000	10,000	150,000	*a*	.1949	.1523	.1944	.0421	.0005	
			b	.2035	.1542	.1960	.0418	.0075	Temperature about 200° Fahr.
			c	.2027	.1550	.1967	.0417	.0060	
55,000	10,000	160,000	*a*	.2018	.1539	.1958	.0419	.0060	
			b	.2035	.1566	.1966	.0406	.0069	
			c	.2011	.1548	.1961	.0413	.0050	
55,000	10,000	170,000	*a*	.1955	.1538	.1954	.0416	.0001	
			b	.1980	.1536	.1951	.0415	.0029	
			c	.2039	.1554	.1969	.0415	.0070	
55,000	10,000	180,000	*a*	.1992	.1549	.1960	.0411	.0032	
			b	.2039	.1558	.1970	.0412	.0069	
			c	.2010	.1553	.1963	.0410	.0047	

No. 6.—*O. H. steel bar*, 5–803—Continued.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.					Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.				
Pounds.				*Inch.*	*Inch.*	*Inch.*		*Inch.*	*Inch.*	
60,000	0	180,000	*a*	.2016	.1508	.1962		.0454	.0054	
			b	.2015	.1509	.1959		.0450	.0056	
			c	.2020	.1503	.1957		.0454	.0063	
60,000	10,000	190,000	*a*	.....	.1425	.1877		.0452	.....	
			b	.2027	.1539	.1981		.0442	.0046	Temperature about 230° Fahr.
			c	.2081	.1602	.2040		.0438	.0041	
										Shaft cooled with water.
60,000	0	190,000	*a*	.1933	.1408	.1907		.0439	.0026	
			b	.2012	.1541	.1986		.0445	.0026	Temperature 75° Fahr.
			c	.2065	.1600	.2040		.0440	.0025	
60,000	10,000	200,000	*a*	.1951	.1489	.1938		.0449	.0013	
			b	.2008	.1597	.2040		.0443	.0058	
			c	.1963	.1488	.1938		.0450	.0025	
										Reated 39 hours unloaded.
60,000	0	200,000	*a*	.1980	.1514	.1953		.0444	.0022	
			b	.2060	.1596	.2040		.0444	.0029	
			c	.1967	.1500	.1945		.0445	.0022	
60,000	10,000	210,000	*a*	.2101	.1566	.2022		.0456	.0079	
			b	.1965	.1484	.1942		.0458	.0023	
			c	.1983	.1507	.1955		.0448	.0028	
60,000	10,000	220,000	*a*	.1877	.1414	.1870		.0456	.0007	
			b	.2061	.1540	.1995		.0455	.0066	
			c	.2040	.1555	.2008		.0453	.0041	
60,000	10,000	230,000	*a*	.2089	.1550	.2017		.0467	.0072	
			b	.1935	.1448	.1914		.0466	.0021	
			c	.2012	.1528	.1979		.0451	.0033	
60,000	9,000	239,000	.....	.....	.....	.....		.....	.....	Bar ruptured.

Section taken from shaft No. 7.

Examined for internal strains.



H Ex 45 50 2

TEST NO. 7.—*O. H. steel bar, marked 7–823.*

Turned down from a bar $1\frac{1}{4}''$ diameter.

The original tensile test gave the following results:

Elastic limit per square inch	pounds..	57,000
Tensile strength per square inch	do....	116,000
Elongation in 30 inches	per cent..	8.8
Contraction of area	do....	26.2
Appearance of fracture		granular, silky spot near the center

This shaft showed no appreciable set under 35,000 pounds per square inch fiber stress.

Under 40,000 pounds per square inch, the measurements taken before rotating showed a set of ".0001 on each line.

After rotating under this load higher sets were found, which is a noticeable feature in some other experiments. The sets, which are small at first, increase after the shaft has rotated without change of load.

This remark does not appear to be applicable under all circumstances, as there are instances in which larger sets appear to diminish, at least for a time, under repeated stresses.

After 500,000 rotations, the highest fiber stress being 50,000 pounds per square inch, the test was discontinued.

A section $5\frac{3}{4}$ inches long was taken from the middle of the shaft and examined for the presence of internal strains.

If internal strains exist, their presence becomes manifest by cutting away a portion of the metal, whereupon the remaining portion changes its shape, having been relieved of the strains in the metal cut away, unless the parts removed contained opposing strains of equal magnitude.

Other tests having shown that internal strains were introduced by stresses exceeding the elastic limit of the metal, thereby causing permanent sets, the metal of this shaft was examined for the purpose of ascertaining whether internal strains had been introduced to an appreciable extent by reason of the repeated stresses received, which had caused the sets recorded in the details of this test.

It should be borne in mind, however, that the amount of metal overstrained in this test must necessarily form but a small part of the metal in a section of the shaft large enough to admit of being experimented upon.

The accompanying sketch shows how the middle section was prepared for examination:

A bar was fastened to each end of the $5\frac{3}{4}''$ section, and near the extremities of these bars were established some drilled and counter-sunk holes, their distance apart being 6". The holes were 5".9 from the axis of the section of shaft.

Measurements were taken from bar to bar before any metal was removed from the shaft, and again after the metal had been planed off to different depths.

The metal on side A was planed off a length of 2"; first $\frac{1}{16}''$ deep, then $\frac{1}{8}''$ deep, measured on the versed sine of the chord.

There was no appreciable change in the distance between the ends of the bars.

Whatever strains there may have been, if any existed, affected so small a part of the cross-section of metal as to elude detection by this method of examination.

The section of shaft was now bent in the plane of the end bars by transverse stress, and a permanent set given of ".10. Cutting away

the metal on the convex side of the bend, side B, in successive depths of $\frac{1}{16}''$ each, the extremities of the bars on the same side of the shaft approached each other as follows:

When the depth of cut was $\frac{1}{16}''$, distance between ends of bars diminished $''.0005$; when the cut was $\frac{1}{8}''$ deep, the distance was diminished $''.0037$, and with a cut $\frac{3}{16}$ deep the distance diminished the total, $''.0060$. Here were internal strains of measurable extent, and appear to have been compression strains, left on the tension side of the bend.

No. 7.—*O. H. steel bar*, 7–823.

Diameter, 1″. Speed of rotation, 400 per minute. Distance between end bearings, 33″. Deflections measured on chord of 10 inches.

Maximum fibre stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
30,000	0	0	*a*	.2002	.1778	.2002	.0224	0.	
			b	.2003	.1783	.2003	.0220	0.	
			c	.2000	.1778	.2000	.0222	0.	
30,000	50,000	50,000	*a*	.2002	.1780	.2002	.0222	0.	
			b	.2003	.1782	.2003	.0221	0.	
			c	.2000	.1777	.2000	.0223	0.	
30,000	.....	.....	.....	.....	.....	.....	.....	.....	Rotated 17,000 times, then rested 39 hours unloaded.
30,000	50,000	100,000	*a*	.2003	.1782	.2003	.0221	0.	
			b	.2003	.1784	.2003	.0219	0.	
			c	.2001	.1779	.2001	.0222	0.	
35,000	50,000	150,000	*a*	.2003	.1742	.2003	.0261	0.	
			b	.2003	.1742	.2003	.0261	0.	
			c	.2001	.1741	.2001	.0260	0.	
35,000	50,000	200,000	*a*	.2003	.1742	.2003	.0261	0.	
			b	.2003	.1745	.2003	.0258	0.	
			c	.2001	.1742	.2001	.0259	0.	
40,000	0	200,000	*a*	.2004	.1707	.2003	.0296	.0001	
			b	.2004	.1707	.2003	.0296	.0001	
			c	.2002	.1707	.2001	.0294	.0001	
40,000	26,000	226,000	*a*	.2004	.1702	.2002	.0300	.0002	
			b	.2003	.1702	.2001	.0299	.0002	
			c	.2003	.1702	.1999	.0297	.0004	
40,000	0	226,000	*a*	.2006	.1703	.2002	.0299	.0004	Rested 15 hours unloaded.
			b	.2005	.1703	.2002	.0299	.0003	
			c	.2003	.1700	.1998	.0298	.0005	
40,000	24,000	250,000	*a*	.2005	.1704	.2001	.0297	.0004	
			b	.2006	.1706	.2001	.0295	.0005	
			c	.2003	.1706	.1998	.0292	.0005	

No. 7.—*O. H. steel bar*, 7–823—Continued.

Maximum fiber stress per square inch	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive	Total.	On line	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
40,000	50,000	300,000	*a*	.2007	.1702	.2000	.0298	.0007	
			b	.2003	.1701	.2001	.0300	.0002	
			c	.2003	.1699	.1998	.0299	.0005	
45,000	0	300,000	*a*	.2006	.1607	.1999	.0332	.0007	
			b	.2006	.1668	.2000	.0332	.0006	
			c	.2004	.1664	.1997	.0333	.0007	
45,000	0	300,000	*a*	.2006	.1693	.1999	.0336	.0007	Rested 1 hour unloaded.
			b	.2007	.1683	.2000	.0337	.0007	Temperature of shaft about 100° Fahr.
			c	.2003	.1663	.1997	.0334	.0006	
	50,000	350,000	*a*	.1999	.1648	.1989	.0341	.0010	
			b	.2016	.1654	.1993	.0339	.0023	
			c	.2008	.1653	.1991	.0338	.0017	
	30,500	380,500	*a*	.2012	.1648	.1991	.0343	.0021	
			b	.2015	.1656	.1993	.0337	.0022	
			c	.2010	.1658	.1991	.0333	.0019	
	0	380,500	*a*	.2010	.1663	.1996	.0333	.0014	Rested 15 hours unloaded.
			b	.2012	.1662	.1996	.0334	.0016	
			c	.2006	.1655	.1992	.0337	.0014	
40,000	19,500	400,000	*a*	.1990	.1652	.1989	.0337	.0001	
			b	.2005	.1652	.1992	.0339	.0013	
			c	.2018	.1657	.1992	.0335	.0021	
40,000	0	400,000	*a*	.2010	.1617	.1989	.0372	.0021	
			b	.2013	.1613	.1990	.0377	.0023	
			c	.2013	.1612	.1990	.0378	.0023	
50,000	45,000	445,000	*a*	.1969	.1584	.1966	.0382	.0003	
			b	.2003	.1590	.1974	.0384	.0029	
			c	.2036	.1600	.1980	.0380	.0056	
50,000	0	445,000	*a*	.2019	.1595	.1978	.0383	.0041	Rested 1 hour unloaded.
			b	.2022	.1603	.1983	.0380	.0039	
			c	.2021	.1597	.1981	.0384	.0040	Temperature about 120° Fahr.
50,000	55,000	500,000	*a*	.2008	.1588	.1972	.0384	.0036	
			b	.2037	.1599	.1982	.0383	.0055	
			c	.2018	.1591	.1976	.0385	.0042	
									Test discontinued.

TEST NO. 8.—*O. H. steel bar, marked* 8–750.

Turned down from a bar 1¼″ diameter.
The original tensile test gave the following results:

Elastic limit per square inch	pounds..	70,000
Tensile strength per square inch	do....	149,600
Elongation in 30 inches	per cent..	5.0
Contraction of area	do....	5.4

Appearance of fracture, granular, radiating from a center-punch mark in the surface of the stem, used in laying off the bar into inch sections before testing.

Loads on the shaft began at 20,000 pounds per square inch fiber stress. The measurements showed regularity and smoothness of action of the shaft under this and succeeding higher stresses. Sets which could with certainty be identified as such, first appeared when the load reached 50,000 pounds per square inch.

The temperature of the shaft was slightly increased when the total number of rotations reached 750,000, and again at 1,100,000 turns. On the latter occasion the temperature reached 150° Fahr., and was attributed to the absence of lubricant between the shaft and the bronze ring at the middle of the shaft, which was allowed to run nearly dry.

After oiling the shaft ran cooler, but with a perceptibly higher temperature than that of the testing room.

Observations were made on the total deflection of the shaft slowly rotated and under full speed, by means of the micrometer on the cross-bar below the shaft.

The results were variable under the lower loads; at 52,000 and 54,000 pounds per square inch the differences appeared to be ″.0010 and ″.0005, respectively, the deflections measuring greater while the shaft was rotating at full speed.

The difficulty of getting exact measurements favors the belief that the deflections were almost identical regardless of the speed of rotation.

The shaft finally ruptured after 1,412,000 rotations. The largest set observed during the test was ″.0014.

From the fact that measurements of the gauged lengths show little or no extension or contraction of the shaft in a longitudinal direction during testing, and up to the time of rupture, it would seem to follow that the tension and compression sets are of equal magnitude.

The ruptured surface was granular, radiating from a dull smooth section at the circumference, where a crack had probably developed first, and had reached a depth of ″.15.

No. 8.—*O. H. steel bar*, 8–750.

Diameter, 1″. Speed of rotation, 400 per minute. Distance between end bearings, 33″. Deflections measured on chord of 10 inches.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
20,000	0	0	*a*	.2012	.1864	.2012	.0148	0.	
			b	.2013	.1866	.2013	.0147	0.	
			c	.2012	.1863	.2012	.0149	0.	
20,000	50,000	50,000	*a*	.2013	.1864	.2013	.0149	0.	
			b	.2012	.1865	.2012	.0147	0.	
			c	.2012	.1864	.2012	.0148	0.	
20,000	50,000	100,000	*a*	.2013	.1863	.2013	.0150	0.	
			b	.2013	.1864	.2013	.0149	0.	
			c	.2013	.1864	.2013	.0149	0.	
25,000	0	100,000	*a*	.2013	.1827	.2013	.0186	0.	Rested 15 hours unloaded.
			b	.2013	.1827	.2013	.0186	0.	
			c	.2012	.1825	.2012	.0187	0.	
25,000	50,000	150,000	*a*	.2013	.1826	.2013	.0187	0.	
			b	.2013	.1827	.2013	.0186	0.	
			c	.2013	.1826	.2013	.0187	0.	
25,000	50,000	200,000	*a*	.2013	.1826	.2013	.0187	0.	
			b	.2013	.1826	.2013	.0187	0.	
			c	.2013	.1826	.2013	.0187	0.	
30,000	0	200,000	*a*	.2013	.1790	.2013	.0223	0.	
			b	.2014	.1789	.2013	.0223	.0001	
			c	.2012	.1790	.2012	.0222	0.	
30,000									Rotated 38,500 times, then rested 39 hours unloaded.
30,000	50,000	250,000	*a*	.2013	.1790	.2013	.0223	0.	
			b	.2013	.1790	.2013	.0223	0.	
			c	.2013	.1790	.2013	.0223	0.	
30,000	50,000	300,000	*a*	.2013	.1790	.2013	.0223	0	
			b	.2013	.1790	.2013	.0223	0.	
			c	.2013	.1790	.2013	.0223	0.	

35,000	0	300,000	*a*	.2013	.1754	.2013	.0259	0.	
			b	.2014	.1756	.2014	.0258	0.	
			c	.2013	.1754	.2013	.0259	0.	
35,000	50,000	350,000	*a*	.2013	.1753	.2013	.0260	0.	
			b	.2013	.1754	.2013	.0259	0.	
			c	.2013	.1753	.2013	.0260	0.	
35,000	50,000	400,000	*a*	.2014	.1753	.2014	.0261	0.	
			b	.2014	.1754	.2014	.0260	0.	
			c	.2014	.1753	.2013	.0260	.0001	
40,000	0	400,000	*a*	.2013	.1715	.2013	.0298	0.	
			b	.2013	.1718	.2013	.0295	0.	
			c	.2013	.1718	.2013	.0295	0.	
40,000	50,000	450,000	*a*	.2014	.1716	.2014	.0298	0.	
			b	.2013	.1718	.2013	.0295	0.	
			c	.2014	.1718	.2013	.0295	.0001	
40,000	50,000	500,000	*a*	.2014	.1718	.2013	.0295	.0001	
			b	.2014	.1716	.2014	.0298	0.	
			c	.2014	.1718	.2014	.0296	0.	
45,000	0	500,000	*a*	.2013	.1677	.2013	.0336	0.	
			b	.2014	.1679	.2014	.0335	0.	
			c	.2013	.1678	.2013	.0335	0.	
45,000	50,000	550,000	*a*	.2015	.1676	.2014	.0338	.0001	
			b	.2015	.1679	.2015	.0336	0.	
			c	.2014	.1679	.2014	.0335	0.	
45,000	50,000	600,000	*a*	.2014	.1677	.2014	.0337	0.	Rotated 11,000 times, then rested 15 hours unloaded.
			b	.2014	.1679	.2014	.0335	0.	
			c	.2014	.1678	.2014	.0336	0.	
50,000	0	600,000	*a*	.2014	.1638	.2013	.0375	.0001	
			b	.2015	.1641	.2014	.0373	.0001	
			c	.2014	.1640	.2013	.0373	.0001	
50,000	50,000	650,000	*a*	.2012	.1640	.2011	.0371	.0001	
			b	.2015	.1640	.2013	.0373	.0002	
			c	.2015	.1639	.2013	.0374	.0002	
50,000	50,000	700,000	*a*	.2012	.1637	.2012	.0375	0.	
			b	.2016	.1639	.2014	.0375	.0002	
			c	.2015	.1639	.2013	.0374	.0002	
51,000	.....	.....	.....	.....	.....	.....	.....	.....	Rotated 23,000 times, then rested 15 hours unloaded
51,000	50,000	750,000	*a*	.2013	.1634	.2012	.0378	.0001	
			b	.2015	.1632	.2013	.0381	.0002	
			c	.2015	.1633	.2012	.0379	.0003	

No. 8.—*O. H. steel bar*, 8-750—Continued.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.			Deflections.		Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
51,000	50,000	800,000	*a*	.2014	.1631	.2012	.0381	.0002	
			b	.2014	.1630	.2012	.0382	.0002	
			c	.2015	.1634	.2012	.0378	.0003	
52,000	50,000	850,000	*a*	.2011	.1620	.2010	.0390	.0001	
			b	.2016	1625	.2011	.0386	.0005	
			c	.2015	1622	.2011	.0389	.0004	
52,000	50,000	900,000	*a*	.2011	1622	.2011	.0389	0.	Rotated 36,500 times, then rested 15 hours unloaded.
			b	.2015	1625	.2013	.0388	.0002	
			c	.2016	1624				
53,000	50,000	950,000	*a*	.2011	1614	.2010	.0396	.0001	
			b	.2016	1615	.2012	.0397	.0004	
			c	.2016	.1615	.2011	.0396	.0005	
53,000	50,000	1,000,000	*a*	.2013	.1614	.2010	.0396	.0003	
			b	.2018	.1615	.2012	.0397	.0006	
			c	.2016	.1616	.2011	.0395	.0005	
54,000	50,000	1,050,000	*a*	.2017	.1604	.2011	.0407	.0006	
			b	.2014	.1606	.2010	.0404	.0004	
			c	.2017	.1607	.2011	.0404	.0006	
54,000	0	1,050,000	*a*	.2018	.1610	.2012	.0402	.0006	Rested 15 hours unloaded.
			b	.2016	.1612	.2011	.0399	.0005	
			c	.2016	.1609	.2011	.0402	.0005	
54,000	50,000	1,100,000	*a*	.2019	.1609	.2011	.0402	.0008	
			b	.2017	.1606	.2011	.0405	.0006	
			c	.2017	.1609	.2011	.0402	.0006	
55,000	50,000	1,150,000	*a*	.2018	.1596	.2009	.0413	.0009	
			b	.2019	.1598	.2010	.0412	.0009	
			c	.2017	.1599	.2010	.0411	.0007	
55,000	50,000	1,200,000	*a*	.2009	.1594	.2008	.0414	.0001	
			b	.2020	.1599	.2011	.0412	.0009	
			c	.2018	.1597	.2010	.0413	.0008	
56,000									Rotated 19,000 times, then rested 39 hours unloaded.

55,000	50,000	1,250,000	*a*	.2012	.1586	.2009	.0423	.0003	
			b	.2015	.1593	.2009	.0416	.0006	
			c	.2020	.1590	.2010	.0420	.0010	
56,000	50,000	1,300,000	*a*	.2008	.1584	.2005	.0421	.0003	
			b	.2019	.1594	.2010	.0416	.0009	
			c	.2020	.1590	.2010	.0420	.0010	
57,000	50,000	1,350,000	*a*	.2010	.1580	.2007	.0427	.0003	
			b	.2022	.1577	.2009	.0432	.0013	
			c	.2019	.1583	.2010	.0427	.0009	
57,000	50,000	1,400,000	*a*	.2023	.1581	.2009	.0428	.0014	Rotated 40,000 times, then rested 15 hours unloaded.
			b	.2019	.1583	.2011	.0428	.0008	
			c	.2020	.1582	.2011	.0429	.0009	
58,000	12,000	1,412,000							Bar ruptured.

TESTS NOS. 9 and 10.—*Specimens D and E from muck-bar tender axle No. 6.*

The location in the axle from whence these bars came, and the tensile test of an adjacent bar, is given elsewhere in this report under the head of Railway axles.

The test of bar No. 9, marked D, began under 10,000 pounds per square inch, and the load was increased by increments of 1,000 pounds per square inch, usually after 50,000 rotations under each load.

There was a very gradual introduction of sets as the loads were increased.

Rupture occurred under a load of 33,000 pounds per square inch, after having made 1,170,420 rotations. A crack on one side of the shaft reached a depth of about $\frac{1}{4}''$, as shown by the smooth surface of this part of the fracture; the remaining part of the surface was irregular and had a fibrous appearance.

There was no appreciable rise in temperature preceding rupture.

The loads on bar No. 10, marked E, began with 33,000 pounds per square inch and were increased by increments of 1,000 pounds per square inch, the shaft rupturing under 35,000 pounds per square inch, after making 147,800 rotations.

The first load caused a maximum observed set of ".0026.

Under 34,000 pounds per square inch the temperature of the shaft reached about 105° Fahr. After the rest of 15 hours the bar was not perceptibly warmed.

Rupture occurred by the development of a fine crack $\frac{1}{4}''$ from the middle bearing. The test was discontinued when this crack was $1\frac{1}{4}''$ long, measured on the circumference, before rupture was completed.

No. 9.—*Specimen D from muck-bar tender axle No. 6.*

Diameter, 1″. Speed of rotation, 400 per minute. Distance between end bearings, 33″. Deflections measured on chord of 10 inches.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch*	*Inch.*	*Inch.*	*Inch.*	
10,000	0	0	*a*	.2000	.1924	.2000	.0066	0.	
			b	.2004	.1928	.2004	.0076	0.	
			c	.2000	.1924	.1999	.0075	.0001	
10,000	50,000	50,000	*a*	.2001	.1925	.2001	.0076	0.	
			b	.2005	.1928	.2004	.0076	.0001	
			c	.2000	.1924	.1999	.0075	.0001	
11,000	50,000	100,000	*a*	.2002	.1917	.2001	.0084	.0001	
			b	.2005	.1920	.2004	.0084	.0001	
			c	.2000	.1916	.1999	.0083	.0001	
12,000	50,000	150,000	*a*	.2002	.1910	.2001	.0091	.0001	
			b	.2004	.1914	.2004	.0090	0.	
			c	.2001	.1909	.2000	.0091	.0001	
12,000	0	150,000	*a*	.2002	.1910	.2001	.0091	.0001	Rested 15 hours unloaded.
			b	.2005	.1913	.2004	.0091	.0001	
			c	.2001	.1909	.2000	.0091	.0001	
13,000	50,000	200,000	*a*	.2002	.1902	.2000	.0098	.0002	
			b	.2005	.1905	.2004	.0099	.0001	
			c	.2001	.1900	.2000	.0100	.0001	
14,000	52,000	252,000	*a*	.2002	.1894	.2001	.0107	.0001	
			b	.2005	.1898	.2004	.0106	.0001	
			c	.2001	.1894	.2000	.0106	.0001	
15,000	48,000	300,000	*a*	.2002	.1887	.2001	.0114	.0001	
			b	.2005	.1891	.2004	.0113	.0001	
			c	.2001	.1886	.2000	.0114	.0001	
16,000									Rotated 11,000 times, then rested 15 hours unloaded.
16,000	50,000	350,000	*a*	.2003	.1880	.2001	.0121	.0001	
			b	.2005	.1883	.2004	.0121	.0001	
			c	.2001	.1879	.2000	.0121	.0001	

No. 9.—*Specimen D from muck-bar tender axle No. 6*—Continued.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch*	
17,000	50,000	400,000	*a*	.2002	.1872	.2002	.0130	0.	
			b	.2006	.1876	.2004	.0128	.0002	
			c	.2002	.1871	.2000	.0129	.0002	
18,000	50,000	450,000	*a*	.2002	.1863	.2001	.0138	.0001	
			b	.2006	.1866	.2004	.0138	.0002	
			c	.2001	.1862	.2000	.0138	.0001	
19,000									Rotated 30,000 times, then rested 15 hours unloaded.
19,000	52,000	502,000	*a*	.2002	.1854	.2001	.0147	.0001	
			b	.2006	.1859	.2004	.0145	.0002	
			c	.2002	.1855	.2000	.0145	.0002	
20,000	48,000	550,000	*a*	.2002	.1848	.2001	.0153	.0001	
			b	.2006	.1853	.2003	.0152	.0001	
			c	.2002	.1848	.2000	.0152	.0002	
21,000	50,000	600,000	*a*	.2002	.1839	.2001	.0162	.0001	
			b	.2006	.1846	.2004	.0158	.0002	
			c	.2002	.1840	.2000	.0160	.0002	
22,000	50,000	650,000	*a*	.2002	.1832	.2000	.0162	.0002	
			b	.2006	.1838	.2004	.0166	.0002	
			c	.2002	.1832	.2000	.0168	.0002	
23,000	50,000	700,000	*a*	.2003	.1823	.2001	.0178	.0002	
			b	.2007	.1830	.2005	.0175	.0002	
			c	.2002	.1822	.2000	.0178	.0002	
24,000	50,000	750,000	*a*	.2003	.1816	.1999	.0183	.0004	
			b	.2007	.1821	.2004	.0183	.0003	
			c	.2003	.1817	.1999	.0182	.0004	
25,000	50,000	800,000	*a*	.2004	.1808	.1	.0191	.0003	
			b	.2009	.1813	.2	.0189	.0005	
			c	.2003	.1810	.1	.0188	.0005	
26,000									Rotated 24,000 times, then rested 15 hours unloaded.
26,000	50,000	850,000	*a*	.2002	.1801	.1998	.0197	.0004	
			b	.2007	.1806	.2004	.0198	.0003	
			c	.2005	.1798	.1997	.0199	.0008	

27,000	50,000	900,000	*a*	.1998	.1791	.1997	.0206	.0001	
			b	.2009	.1798	.2005	.0207	.0004	
			c	.2005	.1791	.1997	.0206	.0008	
28,000	50,000	950,000	*a*	.2001	.1782	.1996	.0214	.0005	
			b	.2007	.1790	.2003	.0213	.0004	
			c	.2007	.1783	.1996	.0213	.0011	
29,000									Rotated 32,000 times, then rested 39 hours unloaded.
29,000	50,900	1,000,000	*a*	.2007	.1778	.2000	.0222	.0007	
			b	.2009	.1785	.2004	.0219	.0005	
			c	.2004	.1777	.1998	.0221	.0006	
30,000	50,000	1,050,000	*a*	.2003	.1767	.1996	.0229	.0007	
			b	.2006	.1772	.2001	.0229	.0005	
			c	.2008	.1766	.1996	.0230	.0012	
31,000	50,000	1,100,000	*a*	.2011	.1759	.1995	.0236	.0016	
			b	.2010	.1763	.2001	.0238	.0009	
			c	.2007	.1756	.1994	.0238	.0013	
32,000	50,000	1,150,000	*a*	.1996	.1746	.1994	.0248	.0002	
			b	.2007	.1749	.1998	.0249	.0009	
			c	.2010	.1741	.1991	.0250	.0019	
32,000	0	1,150,000	*a*	.2011	.1763	.2005	.0242	.0006	Rested 15 hours unloaded.
			b	.2010	.1757	.2005	.0248	.0005	
			c	.1997	.1744	.1992	.0248	.0005	
33,000	20,420	1,170,420							Bar fractured.

No. 10.—*Specimen E from muck-bar tender axle No. 6.*

Diameter, 1″. Speed of rotation, 400 per minute. Distance between end bearings, 33″. Deflections measured on chord of 10 inches.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
33,000	0	0	*a*	.1989	.1722	.1972	.0250	.0017	
			b	.1997	.1729	.1977	.0248	.0020	
			c	.2001	.1726	.1975	.0249	.0026	
33,000	12,000	12,000	*a*	.1988	.1717	.1970	.0253	.0018	
			b	.1987	.1718	.1973	.0255	.0014	
			c	.2008	.1719	.1973	.0254	.0035	
33,000	8,000	20,000	*a*	.2008	.1719	.1974	.0255	.0034	
			b	.2005	.1725	.1979	.0254	.0026	
			c	.1998	.1718	.1973	.0255	.0025	
33,000	10,000	30,000	*a*	.1986	.1719	.1973	.0254	.0013	
			b	.2011	.1725	.1979	.0254	.0032	
			c	.1998	.1720	.1974	.0254	.0024	
33,000	10,000	40,000	*a*	.1978	.1715	.1971	.0256	.0007	
			b	.1991	.1721	.1977	.0256	.0014	
			c	.2005	.1720	.1975	.0255	.0030	
33,000	10,000	50,000	*a*	.1984	.1717	.1971	.0254	.0013	
			b	.1992	.1720	.1976	.0256	.0016	
			c	.2005	.1732	.1975	.0253	.0030	
34,000	30,000	80,000	*a*	.2011	.1708	.1975	.0267	.0036	
			b	.1998	.1712	.1976	.0264	.0022	
			c	.1998	.1710	.1972	.0262	.0026	
34,000	0	80,000	*a*	.2001	.1730	.1989	.0259	.0012	Rested 15 hours unloaded.
			b	.1998	.1726	.1987	.0250	.0011	
			c	.1985	.1714	.1973	.0259	.0012	
34,000	20,000	100,000	*a*	.1981	.1712	.1974	.0264	.0010	
			b	.1993	.1714	.1978	.0264	.0015	
			c	.2004	.1711	.1974	.0263	.0030	
35,000	47,800	147,800	.....	.....	.....	.....	.....	.....	Bar fractured.

TESTS NOS. 11 and 12.—*Specimens from double refined wrought-iron bar, L 208.*

For original test see Report of 1882, page 196, which was made four years prior to the tests here reported.

The original tensile test gave the following results:

Elastic limit per square inch	pounds..	29,375
Tensile strength per square inch	do....	50,156
Elongation in 80 inches	per cent..	22.7
Contraction of area	do....	43.0
Appearance of fracture		fibrous

The original diameter of the bar was 2.02 square inches, and it was tested in the condition left after hot rolling.

The longer end of the fractured bar furnished the present specimens, which were lettered *a* to *f* inclusive, laid off consecutively, beginning at the original fracture.

Mark.	Kind of specimen.	Dimensions.		Remarks.
		Diameter.	Length.	
		Inches.	*Inches.*	
a	Compression	1.129	12	Not annealed.
b	Tension	.798	9	
c	Endurance	1.000	36	
d	Compression	1.129	12	Annealed before present tests were made.
e	Tension	.798	9	
f	Endurance	1.000	36	

The two compression and tension tests of the unannealed and the annealed bars are as follows:

No. 2075.

Compression test.

Mark, *a*.
Not annealed.
Length, 12″.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 10″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	Initial load.
5,000	5,000	.0014	0.	
10,000	10,000	.0034	0.	
15,000	15,000	.0053	0.	
20,000	20,000	.0070	0.	
25,000	25,000	.0089	.0001	
30,000	30,000	.0109	.0002	
35,000	35,000	.0132	.0008	
40,000	40,000	.0160	.0018	
45,000	45,000	.0203	.0041	
50,000	50,000	.0270	.0089	
55,000	55,000	.0402	.0199	
58,600	58,600	.....	.....	Ultimate strength.

Failed by triple flexure.

No. 2071.

Tension test.

Mark, *b*.
Not annealed.
Diameter, ″.798.
Sectional area, .50 square inch.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
500	1,000	0.	0.	Initial load.
2,500	5,000	.0007	.....	
5,000	10,000	.0016	.....	
7,500	15,000	.0025	.....	
10,000	20,000	.0035	0.	
12,500	25,000	.0045	.....	
15,000	30,000	.0054	.....	
17,500	35,000	.0063	0.	
20,000	40,000	.0072	.....	
22,500	45,000	.0081	0.	
24,000	48,000	.0087	.....	
25,000	50,000	.0090	0.	
26,000	52,000	.0095	.....	
26,500	53,000	.0096	.....	
27,000	54,000	.0098	.....	
27,500	55,000	.0100	.....	
28,000	56,000	.0102	.....	
28,500	57,000	.0105	.....	
29,000	58,000	.0105	.....	
29,500	59,000	.0107	.....	
30,000	60,000	.0110	0.	
30,500	61,000	.0113	.....	
31,000	62,000	.0115	.....	
36,580	73,160	.....	.....	Tensile strength.
0	0	.25	.....	=5.0 per cent.

Fractured 1″.12 from neck. Appearance, fibrous; trace of granulation.

Diameter at fracture, ″.70. Area, .385 square inch. Contraction, 23.0 per cent.

The elastic limit coincided with the tensile strength.

The load fell after reaching the maximum, rupture occurring under about 32,000 pounds, contraction at the place of rupture going on in the mean time.

Elongation of inch sections, ″.00, ″.00, ″.00, ″.13*, ″.12*.

No. 2076.

Compression test.

Mark, *d*.
Annealed.
Length, 12″.
Diameter, 1″.129.
Sectional area, 1 square inch.
Gauged length, 10″.

Applied loads.		In ganged length.		Remarks.
Total.	Per square inch.	Compression.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
1,000	1,000	0.	0.	Initial load.
5,000	5,000	.0015	0.	
10,000	10,000	.0033	0.	
15,000	15,000	.0053	0.	
20,000	20,000	.0077	.0007	
25,000	25,000	.0230	.0146	
28,550	28,550	.....	.....	Ultimate strength.

Failed by triple flexure.

No. 2072.

Tension test.

Mark, *e*.
Annealed.
Diameter, ″.798.
Sectional area, .50 square inch.
Gauged length, 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inches.*	*Inch.*	
500	1,000	0.	0.	Initial load.
2,500	5,000	.0007	.....	
5,000	10,000	.0017	.....	
7,500	15,000	.0026	.....	
10,000	20,000	.0036	0.	
12,500	25,000	.0050	.0005	
13,000	26,000	.0053	.....	Elastic limit.
13,500	27,000	.0058	.....	
14,000	28,000	.0325	.....	
14,500	29,000	.0398	.....	
15,000	30,000	.0510	.....	
15,500	31,000	.0600	.....	
16,000	32,000	.0730	.....	
16,500	33,000	.0840	.....	
17,000	34,000	.0990	.....	
17,500	35,000	.1105	.....	
18,000	36,000	.1270	.....	
18,500	37,000	.1430	.....	
19,000	38,000	.1600	.....	
19,500	39,000	.1775	.....	
20,000	40,000	.195	.....	
20,500	41,000	.23	.....	
21,000	42,000	.24	.....	
21,500	43,000	.27	.....	
22,000	44,000	.31	.....	
22,500	45,000	.35	.....	
23,000	46,000	.38	.....	
23,500	47,000	.43	.....	
24,000	48,000	.48	.....	
24,500	49,000	.55	.....	
25,000	50,000	.65	.....	
25,500	51,000	.82	.....	
25,780	51,560	1.18	.....	Tensile strength.
24,800	.....	.....	.....	At time of fracture.
0	0	.....	.....	=26.2 per cent.

Fractured 2″.9 from neck. Appearance, fibrous.
Diameter at fracture, ″.64. Area, .322 square inch. Contraction, 35.6 per cent.
Elongation of inch sections, ″.21, ″.27, ″.46*, ″.25, ″.12.

In the retest by tension of the unannealed specimen *b* there was no set observed after a load of 60,000 pounds per square inch, and it had a tensile strength of 73,160 pounds per square inch.

In the original test the maximum load was 50,156 pounds per square inch, estimated on the area of the bar before loading, but we are now computing the stresses on the metal after having been extended and reduced in diameter by the first test, and therefore to make a fair comparison of the results, we should consider the maximum stress per square inch on the bar at the time it was under the maximum load of the first test.

An approximation to the maximum stress per square inch is found by dividing the total load by the mean sectional area of the bar at the close of the original test; doing this we find the stress reached 61,540 pounds per square inch; hence the real elevation in tensile strength resulting from the first test and the interval of rest, is the difference between this load and 73,160 pounds per square inch, which is 11,620 pounds per square inch.

The compression specimen *a* showed a set of ".0001 after the load 25,000 pounds per square inch, and the sets increased after higher loads had been applied.

The annealed tensile specimen showed a set of ".0005 after 25,000 pounds per square inch, and an elastic limit of 26,000 pounds per square inch, the tensile strength being 51,560 pounds per square inch.

The annealed compression specimen showed a set of ".0007 after 20,000, and ".0146 after 25,000 pounds per square inch.

The tensile sets were determined in a gauged length of 5"; the compression sets in 10".

From these examples it appears that the metal overstrained by tensile stress followed by a long period of rest, has a limit of perfect elasticity, nearly equal to, or perhaps exceeding the primitive loading for a stress applied in the same direction. The micrometer observations stopped at 60,000 pounds per square inch.

That the metal did not show compressive sets quite so soon as the annealed specimen, and while sets appeared early as compared with the unannealed tensile specimen, yet the previous overstraining had considerable effect on the rigidity of the metal when under high compressive stresses.

The properties of the annealed tensile specimen approached those of the original test.

It would be in advance of the results yet obtained to discuss whether elevating the elastic limit by tensile stress—the elastic limit under compressive stress not being correspondingly elevated—is of substantial value in a rotated shaft where the tensile and compressive stresses are of equal magnitude, or nearly of equal magnitude.

The difference between the treatment of the annealed and the unannealed shafts prevents a direct comparison of their relative endurance being made in this instance; furthermore, it may not be unreasonable to suppose the relative value of the two might depend upon the treatment received while rotating.

Unannealed shaft *c* began with 20,000 pounds per square inch fiber stress, and the loads were gradually advanced to 42,000 pounds per square inch.

Up to 34,000 pounds per square inch the sets which at first appeared had not increased beyond one or two ten-thousandths of an inch; after some loads none were detected. The maximum observed set before rupture was only ".0008.

Under 42,000 pounds per square inch fiber stress the bar ruptured, having made in all 1,130,300 rotations. A crack extended nearly around the shaft.

Measurements were then taken showing the deflections and sets of the shaft with the crack in its present stage of development. The measurements were taken twice before and twice after the shaft had rested 15 hours. The unequal deflections on the different lines are noticeable.

The fracture of the shaft was completed by direct tensile stress, with the following results:

Tensile strength, 31,850 pounds=70,780 pounds per square inch on the section unruptured by rotating test.

Section ruptured by transverse stress when rotating.
Dull fibrous appearance with irregularities of surface somewhat smoothed.

Fibrous and granular sections ruptured by tensile stress, longitudinal direction.

Approximate area of fibrous and granular sections unruptured by transverse rotating test, .45 square inch.

TEST NO. 12.

Annealed wrought-iron shaft F was loaded with 20,000 pounds per square inch fiber stress. This load caused sets which were not increased after the shaft had rotated under this load.

The loads were increased by increments of 1,000 pounds per square inch each; the sets increased with more or less regularity.

The effects of resting, after 900,000 and after 1,150,000 rotations, on the magnitude of the sets is conspicuous.

The shaft ruptured under 32,000 pounds per square inch fiber stress, having made 1,296,650 rotations.

A crack developed 1 inch from the middle bearing, and extended about one-half through the shaft when the rotating test was discontinued, and rupture completed by direct tensile stress.

Tensile strength, 21,100 pounds=53,690 pounds per square inch on the section unruptured by the rotating test.

Section ruptured by transverse stress when rotating.
Appearance, dull fibrous, the irregularities of the surface somewhat smoothed.

Section marked T ruptured by tensile strength in longitudinal direction. Appearance, fibrous.

Approximate area of fibrous section unruptured by transverse rotating test, .393 square inch.

No. 11.—*Unannealed specimen C from wrought-iron bar, L 208.*

Diameter, 1″. Speed of rotation, 400 per minute. Distance between end bearings, 33″. Deflections measured on chord of 10 inches.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
20,000	0	0	*a*	.2009	.1847	.2008	.0161	.0001	
			b	.2014	.1853	.2013	.0160	.0001	
			c	.2015	.1856	.2014	.0158	.0001	
20,000	50,000	50,000	*a*	.2009	.1847	.2009	.0162	0.	
			b	.2013	.1852	.2013	.0161	0.	
			c	.2014	.1852	.2014	.0162	0.	
20,000	50,170	100,170	*a*	.2009	.1849	.2008	.0159	.0001	
			b	.2014	.1852	.2013	.0161	.0001	
			c	.2014	.1852	.2013	.0161	.0001	
22,000									Rotated 20,830 times, then rested 15 hours.
22,000	49,830	150,000	*a*	.2009	.1829	.2009	.0180	0.	
			b	.2015	.1836	.2014	.0178	.0001	
			c	.2015	.1840	.2015	.0175	0.	
22,000	50,000	200,000	*a*	.2010	.1828	.2009	.0181	.0001	
			b	.2014	.1836	.2013	.0177	.0001	
			c	.2014	.1838	.2014	.0176	0.	
24,000	50,000	250,000	*a*	.2010	.1813	.2008	.0195	.0002	
			b	.2014	.1817	.2013	.0196	.0001	
			c	.2015	.1819	.2014	.0195	.0001	
24,000	50,000	300,000	*a*	.2010	.1815	.2010	.0195	0.	Rotated 47,000 times, then rested 15 hours unloaded.
			b	.2014	.1819	.2014	.0195	0.	
			c	.2016	.1820	.2015	.0195	.0001	
26,000	50,000	350,000	*a*	.2009	.1801	.2009	.0208	0.	
			b	.2015	.1804	.2015	.0211	0.	
			c	.2016	.1807	.2016	.0209	0.	
26,000	50,000	400,000	*a*	.2009	.1799	.2009	.0210	0.	
			b	.2015	.1804	.2015	.0211	0.	
			c	.2016	.1806	.2016	.0210	0.	

28,000	50,000	450,000	*a*	.2009	.1780	.2009	.0229	0.	
			b	.2015	.1787	.2014	.0227	.0001	
			c	.2014	.1788	.2014	.0226	0.	
28,000	50,000	500,000	*a*	.2009	.1782	.2009	.0227	0.	Rotated 12,000 times, then rested 39 hours unloaded.
			b	.2016	.1788	.2015	.0227	.0001	
			c	.2016	.1788	.2016	.0228	0.	
30,000	50,000	550,000	*a*	.2010	.1765	.2010	.0245	0.	
			b	.2014	.1771	.2014	.0213	0.	
			c	.2016	.1774	.2016	.0212	0.	
30,000	50,000	600,000	*a*	.2010	.1765	.2010	.0245	0.	
			b	.2015	.1773	.2014	.0241	.0001	
			c	.2014	.1772	.2014	.0242	0.	
32,000									Rotated 30,500 times, then rested 15 hours unloaded.
32,000	50,000	650,000	*a*	.2009	.1749	.2009	.0260	0.	
			b	.2015	.1756	.2014	.0258	.0001	
			c	.2015	.1755	.2014	.0259	.0001	
32,000	50,000	700,000	*a*	.2010	.1748	.2009	.0261	.0001	
			b	.2015	.1757	.2014	.0257	.0001	
			c	.2016	.1756	.2014	.0258	.0002	
34,000	50,000	750,000	*a*	.2010	.1735	.2009	.0274	.0001	
			b	.2016	.1738	.2014	.0276	.0002	
			c	.2016	.1740	.2015	.0275	.0001	
34,000	50,000	800,000	*a*	.2010	.1731	.2009	.0278	.0001	
			b	.2014	.1736	.2013	.0277	.0001	
			c	.2016	.1738	.2015	.0277	.0001	
36,000	50,000	850,000	*a*	.2010	.1716	.2009	.0293	.0001	
			b	.2015	.1719	.2013	.0294	.0002	
			c	.2017	.1726	.2013	.0287	.0004	
36,000	50,000	900,000	*a*	.2011	.1713	.2007	.0294	.0004	
			b	.2015	.1718	.2012	.0294	.0003	
			c	.2016	.1722	.2013	.0291	.0003	
38,000	50,000	950,000	*a*	.2012	.1700	.2008	.0308	.0004	
			b	.2017	.1703	.2012	.0309	.0005	
			c	.2017	.1706	.2013	.0307	.0004	
38,000	50,000	1,000,000	*a*	.2009	.1702	.2009	.0307	0.	Rotated 23,000 times, then rested 15 hours unloaded.
			b	.2018	.1702	.2013	.0311	.0005	
			c	.2018	.1705	.2014	.0309	.0004	
40,000	50,000	1,050,000	*a*	.2008	.1677	.2007	.0330	.0001	
			b	.2019	.1685	.2011	.0326	.0008	
			c	.2019	.1687	.2013	.0326	.0006	

No. 11.—*Unannealed specimen C from wrought-iron bar, L 208*—Continued.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
40,000	50,000	1,100,000	*a*	.2008	.1674	.2008	.0334	0.	
			b	.2015	.1676	.2009	.0333	.0006	
			c	.2019	.1674	.2011	.0337	.0008	
42,000	30,300	1,130,300	*a*	.2080	.1642	.2037	.0395	.0043	Bar ruptured.
			b	.2015	.1613	.1993	.0380	.0022	
			c	.1979	.1497	.1934	.0437	.0045	
42,000	0	1,130,300	*a*	.2074	.1646	.2037	.0391	.0037	
			b	.2030	.1614	.1997	.0383	.0033	
			c	.1973	.1498	.1935	.0437	.0038	
42,000	0	1,130,300	*a*	.2076	.1654	.2044	.0390	.0032	Rested 15 hours unloaded.
			b	.2029	.1619	.2003	.0384	.0026	
			c	.1970	.1503	.1930	.0433	.0034	
42,000	0	1,130,300	*a*	.2075	.1641	.2041	.0400	.0034	
			b	.2028	.1624	.2002	.0378	.0026	
			c	.1973	.1508	.1937	.0429	.0036	

No. 12.—*Annealed specimen F from wrought-iron bar, L 208.*

Diameter, 1″. Speed of rotation, 400 per minute. Distance between end bearings, 33″. Deflections measured on chord of 10 inches.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
20,000	0	0	*a*	.2007	.1840	.2005	.0165	.0002	
			b	.2011	.1843	.2008	.0165	.0003	
			c	.2015	.1845	.2008	.0163	.0007	
20,000	48,000	48,000	*a*	.2008	.1843	.2005	.0162	.0003	
			b	.2014	.1849	.2009	.0160	.0005	
			c	.2013	.1846	.2010	.0164	.0003	
									Rested 15 hours unloaded.
20,000	0	48,000	*a*	.2010	.1844	.2008	.0164	.0002	
			b	.2013	.1847	.2011	.0164	.0002	
			c	.2011	.1846	.2010	.0164	.0001	
20,000	52,000	100,000	*a*	.2008	.1843	.2006	.0163	.0002	
			b	.2013	.1845	.2011	.0166	.0002	
			c	.2014	.1846	.2011	.0165	.0003	
21,000	50,000	150,000	*a*	.2010	.1836	.2008	.0172	.0002	
			b	.2011	.1839	.2010	.0171	.0001	
			c	.2014	.1838	.2009	.0171	.0005	
21,000	50,000	200,000	*a*	.2008	.1834	.2007	.0173	.0001	
			b	.2011	.1837	.2009	.0172	.0002	
			c	.2015	.1838	.2010	.0172	.0005	
22,000	.....	.....	.....	.....	.....	.....	.....	.....	Rotated 17,500 times, then rested 15 hours unloaded.
22,000	50,000	250,000	*a*	.2013	.1825	.2007	.0182	.0006	
			b	.2015	.1830	.2010	.0180	.0005	
			c	.2014	.1828	.2011	.0183	.0003	
22,000	50,000	300,000	*a*	.2010	.1823	.2007	.0184	.0003	
			b	.2015	.1828	.2010	.0182	.0005	
			c	.2014	.1827	.2010	.0183	.0004	
23,000	50,000	350,000	*a*	.2006	.1815	.2004	.0189	.0002	
			b	.2013	.1818	.2009	.0191	.0004	
			c	.2017	.1819	.2008	.0189	.0009	
									Rotated 43,000 times, then rested 15 hours unloaded.

No. 12.—*Annealed specimen F from wrought-iron bar, L 208*—Continued.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
23,000	50,000	400,000	*a*	.2012	.1818	.2009	.0191	.0003	
			b	.2013	.1821	.2010	.0189	.0003	
			c	.2014	.1820	.2011	.0191	.0003	
24,000	50,000	450,000	*a*	.2014	.1807	.2005	.0198	.0009	
			b	.2015	.1812	.2009	.0197	.0006	
			c	.2015	.1810	.2007	.0197	.0008	
24,000	50,000	500,000	*a*	.2013	.1809	.2005	.0196	.0008	Rotated 29,600 times, then rested 1 hour unloaded.
			b	.2015	.1812	.2008	.0196	.0007	
			c	.2015	.1811	.2008	.0197	.0007	
25,000	50,000	550,000	*a*	.2008	.1796	.2003	.0207	.0005	
			b	.2022	.1803	.2008	.0205	.0014	
			c	.2017	.1802	.2007	.0205	.0010	
25,000	50,000	600,000	*a*	.2011	.1799	.2009	.0210	.0002	Rotated 10,000 times, then rested 15 hours unloaded.
			b	.2013	.1805	.2010	.0205	.0003	
			c	.2017	.1806	.2011	.0205	.0006	
26,000	50,000	650,000	*a*	.2014	.1791	.2004	.0215	.0010	
			b	.2018	.1796	.2010	.0214	.0008	
			c	.2016	.1795	.2010	.0215	.0006	
26,000	50,000	700,000	*a*	.2015	.1790	.2005	.0215	.0010	
			b	.2017	.1795	.2009	.0214	.0008	
			c	.2016	.1794	.2008	.0314	.0008	
27,000									Rotated 27,850 times, then rested 15 hours unloaded.
27,000	50,000	750,000	*a*	.2004	.1782	.2003	.0221	.0001	
			b	.2018	.1790	.2010	.0220	.0008	
			c	.2018	.1790	.2010	.0220	.0008	
27,000	50,000	800,000	*a*	.2006	.1780	.2002	.0222	.0004	
			b	.2016	.1789	.2009	.0220	.0007	
			c	.2023	.1787	.2008	.0221	.0015	
		850,000	*a*	.2014	.1774	.2003	.0229	.0011	
			b	.2014	.1779	.2008	.0727	.0008	
			c	.2020	.1779	.2007	.0226	.0013	

28,000	50,000	900,000	*a*	.2018	.1772	.2002	.0230	.0016	
			b	.2018	.1778	.2008	.0230	.0010	
			c	.2019	.1776	.2007	.0231	.0012	
28,000	0	900,000	*a*	.2915	.1783	.2012	.0229	.0003	Rested 89 hours unloaded.
			b	.2016	.1784	.2013	.0229	.0003	
			c	.2010	.1777	.2007	.0230	.0003	
29,000	50,000	950,000	*a*	.2017	.1766	.2004	.0238	.0013	
			b	.2017	.1770	.2007	.0237	.0010	
			c	.2019	.1771	.2006	.0235	.0013	
29,000	50,000	1,000,000	*a*	.2009	.1764	.2002	.0238	.0007	Rotated 26,500 times, then rested 1 hour unloaded.
			b	.2012	.1765	.2003	.0238	.0009	
			c	.2026	.1770	.2005	.0235	.0021	
30,000	60,000	1,060,000	*a*	.2018	.1752	.1998	.0246	.0020	
			b	.2022	.1760	.2004	.0255	.0018	
			c	.2022	.1757	.2005	.0258	.0017	
30,000	0	1,060,000	*a*	.2017	.1767	.2013	.0246	.0004	Rested 15 hours unloaded.
			b	.2015	.1767	.2012	.0245	.0003	
			c	.2008	.1759	.2006	.0247	.0002	
30,000	40,000	1,100,000	*a*	.2003	.1752	.1999	.0247	.0004	
			b	.2026	.1761	.2008	.0247	.0018	
			c	.2017	.1763	.2008	.0245	.0009	
31,000	50,000	1,150,000	*a*	.2014	.1750	.2002	.0252	.0012	Rested 4½ hours unloaded.
			b	.2010	.1744	.1998	.0254	.0012	
			c	.2025	.1753	.2006	.0253	.0019	
31,000	0	1,150,000	*a*	.2019	.1761	.2016	.0255	.0003	Rested 15 hours unloaded.
			b	.2014	.1754	.2010	.0256	.0004	
			c	.2010	.1753	.2007	.0254	.0003	
31,000	50,000	1,200,000	*a*	.2016	.1750	.2003	.0255	.0011	
			b	.2020	.1754	.2007	.0253	.0013	
			c	.2017	.1752	.2006	.0254	.0011	
32,000									Rotated 33,500 times, then rested 1 hour unloaded.
32,000	50,000	1,250,000	*a*	.1996	.1717	.1985	.0268	.0011	
			b	.2035	.1744	.2006	.0262	.0029	
			c	.2026	.1748	.2009	.0261	.0017	
32,000	46,650	1,296,650							Bar ruptured. Place of rupture about 1 inch eccentric on the end opposite the driving end.

TEST NO. 13.—*First wrought-iron bar B.*

Turned down from a bar 1¼″ diameter.

Bars marked B are from the same lot of iron which was used in the temperature tests, distinguished by the same letter.

The tensile test of specimen No. 1900 gave the following results:

Elastic limit per square inch	pounds	30,560
Tensile strength per square inch	do	47,140
Elongation in 5 inches	per cent	34
Contraction of area	do	54.2
Appearance of fracture		fibrous

The load on the shaft began with 25,000 pounds per square inch, which was carried until 1,000,000 rotations were made.

The deflections, measured at intervals in the mean time, showed no decided change. The sets determined before rotating the shaft were ″.0002 on each line; after that they were found at different times to vary from ″.0001 to ″.0017.

From 25,000 pounds per square inch the loads were gradually increased, rupture occurring under 30,000 pounds per square inch fiber stress.

A crack appeared after 750,000 rotations, which extended over 120 degrees of arc, one-half on each side of line *c*. The shaft was run 35,750 rotations after this crack was observed, after which rupture was completed by direct tensile stress.

Measurements of the gauged lengths taken at intervals during the rotating test were as follows:

Total number of rotations.	Gauged lengths, lines.		
	a	*b*	*c*
	Inches.	*Inches.*	*Inches.*
0	9.9788	9.9983	9.9925
400,000	9.9785	9.9980	9.9919
1,200,000	9.9789	9.9985	9.9925
1,300,000	9.9787	9.9980	9.9923
1,785,750	9.9787	9.9980	9.9936

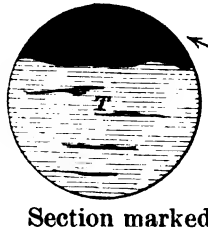
The last set of measurements was taken after the rotating test had been discontinued.

The greater length along line *c* was attributed to the bent shape of the shaft and the opening of the crack on that side.

There was a slight rise in the temperature of the bar when 1,300,000 rotations were reached.

The tensile test gave the following results:

Tensile strength, 30,200 pounds=47,940 pounds per square inch on the section unruptured by rotating test.



The section ruptured by transverse stress while rotating.

Appearance, fibrous, with traces of fine granulation interspersed.

Irregularities of surface somewhat smoothed

Section marked T ruptured by tensile stress in longitudinal direction. Appearance, fibrous.

Approximate area of section ruptured by tensile stress, .63 square inch.

No. 13.—*First wrought-iron bar B.*

Diameter, 1″. Speed of rotation, 400 per minute. Distance between end bearings, 33″. Deflections measured on chord of 10 inches.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
25,000	0	0	*a*	.2011	.1820	.2009	.0189	.0002	
			b	.2007	.1816	.2005	.0189	.0002	
			c	.2006	.1814	.2004	.0190	.0002	
25,000	50,000	50,000	*a*	.2021	.1817	.2007	.0190	.0014	
			b	.2007	.1807	.1998	.0191	.0009	
			c	.2014	.1811	.2000	.0189	.0014	
25,000	88,000	88,000	*a*	.2009	.1814	.2004	.0190	.0005	
			b	.2007	.1809	.1998	.0189	.0009	
			c	.2017	.1812	.2000	.0188	.0017	
25,000	12,000	100,000	*a*	.2007	.1816	.2005	.0189	.0002	
			b	.2015	.1815	.2004	.0189	.0011	
			c	.2009	.1813	.2000	.0187	.0009	
25,000	50,000	150,000	*a*	.2006	.1813	.2004	.0191	.0002	
			b	.2012	.1812	.2002	.0190	.0010	
			c	.2012	.1811	.2000	.0189	.0012	
25,000	50,000	200,000	*a*	.2016	.1816	.2007	.0191	.0009	
			b	.2015	.1813	.2003	.0190	.0012	
			c	.2010	.1808	.2001	.0193	.0009	
25,000									40,000 rotations made, and then bar allowed to rest unloaded 15 hours.
25,000	50,000	250,000	*a*	.2009	.1818	.2008	.0190	.0001	
			b	.2011	.1816	.2005	.0189	.0006	
			c	.2010	.1813	.2001	.0188	.0009	
25,000	50,000	300,000	*a*	.2009	.1816	.2007	.0191	.0002	
			b	.2010	.1814	.2004	.0190	.0006	
			c	.2013	.1812	.2001	.0189	.0012	
25,000	50,000	350,000	*a*	.2019	.1817	.2008	.0191	.0011	
			b	.2009	.1812	.2002	.0190	.0007	
			c	.2010	.1812	.2001	.0189	.0009	
									46,740 rotations made, and then bar allowed to rest unloaded 15 hours.

No. 13.—*First wrought-iron bar B*—Continued.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
25,000	50,000	400,000	*a*	.2006	.1815	.2004	.0189	.0002	
			b	.2008	.1817	.2006	.0189	.0002	
			c	.2012	.1808	.1997	.0189	.0015	
25,000	50,000	450,000	*a*	.2009	.1815	.2005	.0190	.0004	
			b	.2019	.1818	.2008	.0190	.0011	
			c	.2009	.1811	.2000	.0189	.0009	
25,000	50,000	500,000	*a*	.2017	.1813	.2005	.0192	.0012	
			b	.2012	.1813	.2002	.0189	.0010	
			c	.2011	.1811	.2001	.0190	.0010	
25,000	50,000	550,000	*a*	.2012	.1817	.2006	.0189	.0006	Rested 18 hours unloaded.
			b	.2008	.1813	.2002	.0189	.0006	
			c	.2014	.1809	.1999	.0190	.0015	
25,000	50,000	600,000	*a*	.2006	.1816	.2005	.0189	.0001	
			b	.2012	.1815	.2006	.0191	.0006	
			c	.2013	.1812	.2002	.0190	.0011	
25,000	50,000	650,000	*a*	.2005	.1815	.2003	.0188	.0002	41,000 rotations made, and then bar allowed to rest unloaded 15 hours.
			b	.2014	.1815	.2005	.0190	.0009	
			c	.2012	.1814	.2003	.0189	.0009	
25,000	50,000	700,000	*a*	.2018	.1817	.2008	.0191	.0010	
			b	.2013	.1816	.2006	.0190	.0007	
			c	.2012	.1813	.2003	.0190	.0009	
25,000	50,000	750,000	*a*	.2016	.1816	.2006	.0190	.0010	
			b	.2015	.1815	.2005	.0190	.0010	
			c	.2010	.1812	.2002	.0190	.0008	
25,000	50,000	800,000	*a*	.2019	.1819	.2009	.0190	.0010	Rested 15 hours unloaded.
			b	.2015	.1819	.2008	.0189	.0007	
			c	.0008	.1813	.2003	.0190	.0005	
25,000	50,000	850,000	*a*	.2009	.1818	.2004	.0191	.0005	
			b	.2019	.1814	.2004	.0190	.0006	
			c	.2013	.1812	.2000	.0188	.0013	

25,000	50,000	900,000	*a*	.2009	.1815	.2005	.0190	.0004	
			b	.2010	.1813	.2003	.0190	.0007	
			c	.2015	.1812	.2001	.0189	.0014	
25,000	50,000	950,000	*a*	.2006	.1814	.2005	.0191	.0001	
			b	.2006	.1811	.2002	.0191	.0004	
			c	.2013	.1813	.2002	.0189	.0011	
25,000	50,000	1,000,000	*a*	.2007	.1814	.2005	.0191	.0002	Rested 39 hours unloaded.
			b	.2010	.1814	.2003	.0189	.0007	
			c	.2013	.1812	.2002	.0190	.0011	
27,000	50,000	1,050,000	*a*	.2007	.1797	.2001	.0204	.0006	
			b	.2022	.1795	.2000	.0205	.0022	
			c	.2015	.1796	.1998	.0202	.0017	
27,000	50,000	1,100,000	*a*	.2015	.1799	.2003	.0204	.0012	
			b	.2021	.1798	.2003	.0205	.0018	
			c	.2013	.1795	.1998	.0203	.0015	
27,000	50,000	1,150,000	*a*	.2010	.1798	.2002	.0204	.0008	7,000 rotations made, then rested 15 hours unloaded.
			b	.2020	.1796	.2000	.0204	.0020	
			c	.2014	.1795	.1999	.0204	.0015	
27,000	50,000	1,200,000	*a*	.2020	.1800	.2004	.0204	.0016	
			b	.2008	.1794	.1997	.0203	.0011	
			c	.2016	.1796	.1998	.0202	.0018	
28,000	50,000	1,250,000	*a*	.2012	.1789	.1999	.0210	.0013	48,000 rotations made, then rested 15 hours unloaded.
			b	.2009	.1786	.1996	.0210	.0013	
			c	.2022	.1789	.1998	.0209	.0024	
28,000	50,000	1,300,000	*a*	.2001	.1779	.1994	.0215	.0007	
			b	.2013	.1784	.1996	.0212	.0017	
			c	.2026	.1782	.1996	.0214	.0030	
28,000	50,000	1,350,000	*a*	.2027	.1783	.1998	.0215	.0029	
			b	.2018	.1784	.1995	.0211	.0023	
			c	.2019	.1783	.1994	.0211	.0025	
28,000	50,000	1,400,000	*a*	.2004	.1790	.2003	.0213	.0001	49,300 rotations made, then rested 15 hours unloaded.
			b	.2014	.1792	.2003	.0211	.0011	
			c	.2017	.1786	.1996	.0210	.0021	
29,000	50,000	1,450,000	*a*	.2012	.1773	.1995	.0222	.0017	
			b	.2037	.1777	.1995	.0218	.0042	
			c	.2016	.1767	.1987	.0220	.0029	
29,000	50,000	1,500,000	*a*	.2026	.1772	.1993	.0221	.0033	
			b	.2026	.1772	.1992	.0220	.0034	
			c	.2020	.1769	.1988	.0219	.0032	

No. 13.—*First wrought iron-bar B*—Continued.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
20,000	50,000	1,550,000	*a*	.1992	.1768	.1989	.0221	.0003	
			b	.2013	.1770	.1990	.0220	.0023	
			c	.2029	.1770	.1989	.0219	.0040	
29,000	0	1,550,000	*a*	.2024	.1795	.2013	.0218	.0011	Measurements after 15 hours' rest.
			b	.2017	.1788	.2006	.0218	.0011	
			c	.2002	.1778	.1992	.0214	.0010	
29,000	50,000	1,600,000	*a*	.1992	.1770	.1990	.0220	.0002	
			b	.2031	.1771	.1998	.0227	.0033	
			c	.2020	.1781	.1999	.0218	.0021	
30,000	54,300	1,654,300	*a*	.1988	.1760	.1987	.0227	.0001	Rested 16 hours unloaded.
			b	.2041	.1783	.2011	.0228	.0030	
			c	.2018	.1773	.2000	.0227	.0018	
30,000	45,700	1,700,000	*a*	.2012	.1756	.1988	.0232	.0024	
			b	.2008	.1752	.1983	.0231	.0025	
			c	.2034	.1756	.1986	.0230	.0048	
30,000	50,000	1,750,000	*a*	.2033	.1778	.2007	.0220	.0026	Measurements after 2 hours' rest.
			b	.1997	.1759	.1987	.0228	.0010	
			c	.2018	.1760	.1994	.0234	.0024	
30,000	0	1,750,000	*a*	.2033	.1788	.2017	.0229	.0016	Rested 41 hours unloaded.
			b	.2007	.1767	.1997	.0230	.0010	
			c	.2009	.1761	.1997	.0236	.0012	
30,000	35,750	1,785,750	*a*	.1992	.1747	.1982	.0235	.0010	Crack in sight.
			b	.2028	.1759	.1996	.0237	.0032	
			c	.2023	.1689	.1940	.0260	.0074	Test discontinued.

TEST NO. 14.—*Second wrought-iron bar B.*

The shaft was first loaded with 35,000 pounds per square inch; the sets caused thereby not being so large as desired, the load was increased to 40,000 pounds per square inch before rotating.

Observations were made at frequent intervals on the sets of the deflected shaft, and the gauged lengths while the shaft was unloaded; also on the difference in the total deflection while under full speed, and when slowly rotated, by means of measurements taken with a micrometer mounted on a cross-bar below the shaft.

Measurements on the deflected condition of the unloaded shaft indicate the amount it runs out of line on the chord of 10 inches, or, in other words, the permanent set resulting from the last loading.

As the direction in which this set is greatest will depend upon the position of the shaft when the load was removed, it will often happen that the maximum amount will be found elsewhere than on one of the lines lettered *a*, *b*, and *c*.

In order to ascertain the maximum set, observations were made at other points on the circumference until the maximum and the minimum micrometer readings were found, which was done by slowly rotating the shaft while the micrometer remained suspended in position.

The following table will show the sets and the gauged lengths on the several lines as they were taken on the unloaded shaft, after completing the rotations set opposite them:

Total number of rotations.	Lines.	Gauged lengths.	Sets.
		Inch.	*Inch.*
0.	*a*	9.9950	0.
	b	9.9955	0.
	c	9.9965	0.
2,000	*a*	9.9892	.021
	b	9.9980	—.008
	c	10.0008	—.013
4,000	*a*	9.9903	.016
	b	9.9958	.003
	c	10.0023	—.016
10,000	*a*	10.0015	—.019
	b	9.9927	.0 2
	c	9.9943	.014
15,000	*a*	9.9950	.004
	b	9.9952	.006
	c	9.9997	—.005
20,000	*a*	9.9967	—.005
	b	9.9939	.007
	c	9.9968	—.002

The minus signs indicate the chord of 10″ falls within the shaft; that is, the side on which those measurements were taken was convex for the time being.

The large sets introduced during this test materially affected the gauged lengths while the shaft was in a bent condition, but when the shaft became nearly straight again the gauged lengths were correspondingly restored to nearly their original values.

Describing the progress of the test, when rotations were begun under a fiber stress of 40,000 pounds per square inch the temperature of the shaft soon began to increase, and at the end of 2,000 rotations had reached a temperature of about 125° Fahr.

Micrometer readings were taken on the lines *a*, *b*, and *c* at the close of this run, again 12 minutes later, and after a rest of 16 hours.

If the original measurements on the unloaded shaft are deducted from these readings the differences will indicate how much the shaft is out of a straight line.

The object of repeating these measurements after intervals of rest was to ascertain whether any appreciable restoration of the shafts occurred in the mean time.

Although differences appear in the fourth place of decimals, it is not conclusive that any change really occurred. The difficulties of measuring to one ten-thousandth of an inch increase as the shaft is bent.

When rotations were resumed, following the above period of rest, the vibrations of the weighted lever were violent during a few turns of the of shaft.

After eight or ten rotations of the shaft the vibrations ceased and the abnormal rigidity was apparently overcome, the shaft then running smoothly.

During the second run of 2,000 rotations the shaft became warm, but did not reach quite so high a temperature as before.

The shaft was stopped and started again during this run, but did not display the initial rigidity so noticeable when it is started after a period of rest.

Before measuring the gauged lengths, following the total run of 4,000 turns, the shaft was cooled to 70° Fahr. About 30 minutes intervened while the gauged lengths were being measured, and when rotations of the shaft were resumed temporary stiffness was observed as before, which caused the weighted lever to vibrate until a few rotations had been made.

Six thousand rotations were made during the next run, making 10,000 total. During this time the shaft reached a temperature of about 180° Fahr.

It was cooled to 70° before measuring. After making 15,000 rotations the deflections and sets were determined while the shaft was still at the high temperature it had acquired while running.

The deflections are conspicuously greater now than when first loaded with 40,000 pounds per square inch. The shaft was cooled to 80° and measured, and again when unloaded after this set of readings.

Observations were made at this time to find the maximum reading of the micrometer, which was found to be ″.2089, against which we had a reading of ″.2243 after 2,000 rotations had been made.

Deducting the original reading, ″.2008 on line *a*, from each of these two readings, and we have the differences ″.0081 and ″.0235 for the sets of the shaft after 15,000 and 2,000 rotations, respectively.

In other words, the permanent set of the shaft is now only a little over one-third what it was after 2,000 rotations. After measuring the gauged lengths, the next operation was to compare the total deflection of the shaft at rest and at full speed.

With the shaft loaded and at rest the micrometer on the cross-bar read ″.0980; with the shaft at full speed ″.1395; therefore the shaft deflects ″.0415 less while running than at rest.

The shaft was run 1,400 turns and these observations repeated, now showing a difference of ″.0449. The shaft was perceptibly warmer than before.

Continuing the run, corresponding observations were made just before 20,000 rotations were reached, the shaft at the time having acquired a

temperature of about 180° Fahr., which showed ″.0635 less deflection running than at rest.

When the bar had cooled to about 80°, the difference had diminished to ″.0555. The shaft was now unloaded and the maximum set noted, which appeared to be ″.0226.

A full set of measurements was next taken on the deflections and sets, the total number of rotations being 20,000; following which observations were repeated on the maximum set, which now appeared to be ″.0069.

Phenomena which appear in so rapid succession are difficult to satisfactorily explain. It was thought at the time of making the test that the manner of loading and unloading the shaft while making the full set of measurements on deflections and sets modified the eccentricity and caused the large reduction in set from ″.0226 to ″.0069, and that the earlier observations had been likewise influenced.

Other data touching upon this obscure point will be presented in a subsequent test.

After resting 15 hours the total set was substantially the same as last noted, and again observed after 14 days' rest without change.

The shaft ruptured under 40,000 pounds per square inch, after making 43,135 rotations.

No. 14.—*Second wrought-iron bar B.*

Diameter, 1″. Speed of rotation, 400 per minute. Distance between end bearings, 33″. Deflections measured on chord of 10 inches.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
35,000	0	0	*a*	.2008	.1740	.2001	.0261	.0007	
			b	.2011	.1745	.2007	.0262	.0004	
			c	.2011	.1743	.2004	.0261	.0007	
40,000	0	0	*a*	.2009	.1686	.1991	.0305	.0018	
			b	.2016	.1706	.2005	.0299	.0011	
			c	.2014	.1701	.2000	.0299	.0014	
40,000	2,000	2,000	*a*	.2243					
			b	.1915					
			c	.1863					
40,000	0	2,000	*a*	.2246					Rested 12 minutes unloaded.
			b	.1919					
			c	.1864					
40,000	0	2,000	*a*	.2247					Rested 16 hours unloaded.
			b	.1914					
			c	.1866					
40,000	8,000	10,000	*a*	.1811	.1509	.1809	.0300	.0002	Rotated 8,000 times, then rested 2 hours unloaded.
			b	.2115	.1700	.2014	.0314	.0101	
			c	.2130	.1741	.2047	.0306	.0083	
40,000	5,000	15,000	*a*	.1980	.1568	.1895	.0327	.0085	
			b	.2167	.1668	.1984	.0316	.0183	Temperature of bar, about 180° Fahr.
			c	.2033	.1093	.1922	.0319	.0111	
40,000	0	15,000	*a*	.2041	.1625	.1937	.0312	.0104	
			b	.2097	.1668	.1983	.0315	.0114	Cooled to 80° Fahr.
			c	.2031	.1612	.1929	.0317	.0102	
40,000	0	15,000	*a*	.2040					
			b	.2057					
			c	.1931					

40,000	5,000	20,000	*a*	.1802	.1479	.1797	.0318	.0005	
			b	.2181	.1694	.2007	.0313	.0174	
			c	.2091	.1678	.1990	.0312	.0101	
40,000	0	20,000	*a*	.1958	.....	.....	.....	.....	
			b	.2075	.....	.....	.....	.....	
			c	.1991	.....	.....	.....	.....	
									Rested 14 days unloaded. Micrometer disturbed since previous readings were taken.
40,000	0	20,000	*a*	.2061	.....	.....	.....	.....	
			b	.2179	.....	.....	.....	.....	
			c	.2093	.....	.....	.....	.....	
40,000	0	20,000	*a*	.2060	.1730	.2039	.0309	.0021	
			b	.2187	.1862	.2165	.0303	.0022	
			c	.2116	.1792	.2096	.0304	.0020	
40,000	1,000	21,000	*a*	.2083	.1696	.2011	.0315	.0072	
			b	.2198	.1782	.2097	.0315	.0101	
			c	.2159	.1765	.2077	.0312	.0082	
40,000	9,000	30,000	*a*	.2206	.1697	.2014	.0192	.0192	
			b	.2217	.1720	.2044	.0173	.0173	Temperature of bar, above 212° Fahr.
			c	.2157	.1714	.2035	.0122	.0122	
40,000	5,000	35,000	*a*	.2151	.1732	.2046	.0314	.0105	
			b	.2248	.1775	.2100	.0325	.0148	Too hot to bear the hand on.
			c	.2095	.1697	.2014	.0317	.0081	
									Rested 1 hour unloaded.
40,000	0	35,000	*a*	.2161	.1794	.2102	.0308	.0059	
			b	.2184	.1807	.2120	.0313	.0064	Bar cooled.
			c	.2077	.1707	.2020	.0313	.0057	
40,000	8,135	43,135	.....	.....	.....	.....	.....	.....	Bar ruptured.

No. 15.—*Third wrought-iron bar B.*

Diameter, 1″. Speed of rotation, 400 per minute. Distance between end bearings, 33″. Deflections measured on chord of 10 inches.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
35,000	0	0	*a*	.2016	.1750	.2012	.0262	.0004	
			b	.2012	.1744	.2007	.0263	.0005	
			c	.2013	.1746	.2009	.0263	.0004	
35,000	50,000	50,000	*a*	.1911	.1670	.1941	.0271	0.	
			b	.2021	.1702	.1973	.0271	.0048	
			c	.2066	.1720	.1992	.0272	.0074	
									Rotated 35,500 times, then rested 15 hours unloaded.
35,000	50,000	100,000	*a*	.1958	.1671	.1945	.0274	.0013	
			b	.2068	.1700	.1975	.0275	.0093	
			c	.2040	.1697	.1973	.0276	.0067	
35,000	50,000	150,000	*a*	.2068	.1700	.1974	.0274	.0094	
			b	.2036	.1703	.1979	.0276	.0057	
			c	.2029	.1700	.1973	.0273	.0056	
35,000	13,000	163,000	*a*	.1946	.1658	.1937	.0279	.0009	
			b	.2068	.1689	.1968	.0279	.0095	
			c	.2051	.1694	.1973	.0279	.0078	
									Rested 1 hour unloaded.
35,000	0	163,000	*a*	.2036	.1725	.1990	.0265	.0046	
			b	.2032	.1718	.1989	.0271	.0043	
			c	.2022	.1706	.1978	.0272	.0044	
35,000	26,900	189,990	.....	.....	.....	.....	.....	.....	Bar ruptured.

TEST NO. 16.—*Fourth wrought-iron bar B.*

Loaded with 35,000 pounds per square inch fiber stress, which was maintained without change until rupture occurred.

The first micrometer readings, ".2012, ".2004, and ".2006, show that the shaft was not round.

Readings were taken before running, giving the deflections and sets in the usual manner, from which we note sets of ".0005, ".0003, and ".0003 resulted.

A micrometer mounted on the cross-bar, below the shaft, was now used for the purpose of measuring the total deflection of the shaft between end bearings. An initial reading was taken before rotations began, and readings repeated at intervals thereafter.

The initial reading of the micrometer was ".0847.

The shaft was slowly rotated 100 turns; the micrometer reading then was ".0520, which indicates an increased deflection of ".0327.

One hundred more turns were given the shaft at the speed of 60 per minute, and the micrometer read ".0360, showing the deflection had increased a total ".0487.

After 300 turns had been made the micrometer read ".0080, indicating a total increase in deflection of ".0767.

When this shaft was started at full speed, following a period of rest, the weighted lever vibrated considerably, as previously referred to when loads cause large sets, but soon ran smoothly.

When turned slowly there was a tendency to vibrate. This behavior appears consistent with the fact that deflection of the shaft is materially less under high than slow speeds, when loaded so as to introduce large sets.

The rotating test was discontinued after making 150,000 turns and the shaft tested by direct tension, the result of which follows:

From the tensile test it is seen that rupture occurred 1 inch inside the 10-inch gauged length, or 6 inches from the middle bearing.

The tensile strength exceeded that of the original bar, and rupture did not take place where the stresses were greatest in the transverse test.

The elongation, however, was less near the middle bearing, and there were cracks developed in the surface of the shaft in that vicinity.

We yet lack conclusive evidence to show what vicissitudes of tenacity are experienced by the metal if rupture is reached with or without elementary parts having been exposed to stresses equal to the tensile or shearing strength of the metal, as determined by test, by once loading.

TEST BY DIRECT TENSION OF SHAFT AFTER ROTATING TEST WAS DISCONTINUED.

Diameter, 1". Sectional area, .7854 square inch.

Approximate elastic limit, 23,600 pounds=30,050 pounds per square inch. Tensile strength, 39,200 pounds=49,910 pounds per square inch.

Fractured 1" outside of 10" section Appearance, fibrous.

At the middle of the bar where the metal was most strained by the transverse test, covering a section 1" long, there were numerous small transverse cracks developed by the tensile test. Most of these cracks were from ".03 to ".05 long. One, however, was ".15 and another ".30 long.

At the surface these cracks were opened about ".003 to ".006 each.

Diameter at fracture, ".71. Area, ".396 square inch. Contraction, 49.6 per cent.

Elongation in 10 inches, 1".17=11.7 per cent. Elongation of inch sections, ".22, ".14, ".10, ".08, ".06, ".06, ".08, ".10, ".13, ".20.

No. 16.—*Fourth wrought-iron bar B.*

Diameter, 1″. Speed of rotation, 400 per minute. Distance between end bearings, 33″. Deflections measured on chord of 10 inches.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
0	0	0	*a*	.2012	.....	.....	.....	.....	
			b	.2004	.....	.....	.....	.....	
			c	.2006	.....	.....	.....	.....	
35,000	0	0	*a*	.2012	.1748	.2007	.0259	.0005	
			b	.2006	.1741	.2003	.0262	.0003	
			c	.2007	.1742	.2004	.0262	.0003	
35,000	300	300	*a*	.2155	.....	.....	.....	.....	
			b	.1852	.....	.....	.....	.....	
			c	.2016	.....	.....	.....	.....	
									Setting of micrometer accidentally disturbed.
35,000	1,200	1,500	*a*	.2184	.1774 / .1765	.2010	.0266	.0144	
			b	.2124	.1765	.2038	.0273	.0086	
			c	.2172	.1799	.2065	.0266	.0107	
35,000	3,500	5,000	*a*	.2190	.1789	.2056	.0267	.0134	
			b	.2097	.1760	.2030	.0270	.0067	
			c	.2175	.1800	.2066	.0266	.0109	
35,000	45,000	50,000	*a*	.2135	.1807	.2078	.0271	.0057	
			b	.2082	.1779	.2048	.0269	.0034	
			c	.2164	.1815	.2086	.0271	.0078	
35,000	8,400	58,400	*a*	.2116	.1787	.2060	.0273	.0056	
			b	.2168	.1801	.2070	.0269	.0098	
			c	.2136	.1795	.2069	.0274	.0067	
35,000	0	58,400	*a*	.2137	.1833	.2100	.0265	.0037	Rested 1 hour.
			b	.2185	.1823	.2090	.0267	.0045	
			c	.2113	.1805	.2074	.0269	.0039	
35,000	41,600	100,000	*a*	.2150	.1826	.2044	.....	.0115	
			b	.2141	.1820	.2088	.0268	.0058	
			c	.2112	.1798	.2068	.0270	.0044	

35,000	37,000	137,000	*a*	.2163	.1821	.2095	.0274	.0068	
			b	.2097	.1792	.2065	.0273	.0032	
			c	.2132	.1818	.2086	.0268	.0046	
35,000	0	137,000	*a*	.2144	.1857	.2125	.0268	.0019	Rested 15 hours unloaded.
			b	.2107	.1823	.2078	.0255	.0029	
			c	.2103	.1820	.2087	.0267	.0016	
35,000	13,000	150,000	*a*	.2080	.1787	.2063	.0276	.0017	
			b	.2161	.1800	.2071	.0271	.0090	
			c	.2139	.1804	.2078	.0274	.0061	Rotating test discontinued.

* After sustaining load 2 minutes.

TEST No. 17.—*Fifth wrought-iron bar B.*

This shaft was tested under 40,000 pounds per square inch fiber stress, except when once reduced to 20,000 pounds per square inch, during which time the shaft made 9,600 rotations.

After measuring the deflections and sets under 40,000 pounds per square inch fiber stress, the maximum sets were determined after successive runs of 1,000 rotations each until 11,000 turns were reached.

The load was removed and the maximum set measured on the chord of 10 inches without taking a full set of readings, loading and unloading the shaft on the different lines *a*, *b*, and *c*; earlier experience having shown the maximum sets in the shaft to be modified by such treatment.

The following table shows the sets at the close of the total number of rotations stated in the first column:

Total number of rotations.	Maximum set on chord of 10 inches.	Remarks.
	Inch.	
1,000	.0246	Shaft somewhat warmed.
2,000	.0230	
3,000	.0214	
4,000	.0203	
5,000	.0211	
6,000	.0186	
7,000	.0168	
8,000	.0183	
9,000	.0177	
10,000	.0178	
11,000	.0188	

It is believed to be satisfactorily shown that in this instance the sets diminish after the shaft has been rotated for a time.

The question whether this increased rigidity is accomplished by reason of the elevation of the limit of perfect elasticity, or whether by reason of the exhaustion of a portion of the elongation which originally belonged to the metal, is in part answered by the behavior of the shaft after the load was reduced to 20,000 pounds per square inch fiber stress.

It appears that sets result from this diminished load.

Observations on the maximum sets following each series of readings as recorded in the details, under 20,000 pounds per square inch, showed the sets to be ".0046 and ".0044, respectively.

This evidence does not favor the idea that the limit of perfect elasticity has been elevated; it raises the question whether it may not have been lowered.

After increasing the load again to 40,000 pounds per square inch, and taking a series of deflection readings in the usual manner, another series of observations was made to determine the maximum sets, as before.

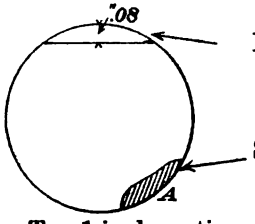
Total number of rotations.	Maximum set in chord of 10 inches.	Remarks.
	Inch.	
20,600	.0031	First set after measuring deflections.
22,000	.0131	
23,000	.0166	
24,900	.0161	
25,000	.0166	
26,000	.0152	
28,000	.0150	
30,000	.0167	

These sets average lower than the first series taken from 1,000 to 11,000 rotations.

After completing the rotating test the bar was examined for internal strains.

A section along one side was flattened in the planer. If any change in shape resulted from the removal of this metal, the means at hand for determining the same were inadequate.

Finally the bar was tested by direct tension, as follows:



Flattened in planer.

Section ruptured by rotating test.

Ten 1-inch sections were laid off symmetrical, with the middle bearing of the rotating test.

Sectional area (deducting .10 square inch for the flattened section, and for irregular shaped section which was ruptured in the rotating test), .7754 square inch.

Tensile strength, 34,900 pounds = 45,010 pounds per square inch.

Fractured at middle of bar, failing in detail, commencing at A and extending across. Cracks also opened along side A at distances of ″.85 to 2″ from the fracture in one direction, and ″.60, 1″.05, 1″.45, and 2″.15 in the opposite direction from the fracture.

Elongation in 10 inches, ″.39 = 3.9 per cent.

Elongation of inch sections, ″.06, ″.04, ″.03, ″.02, ″.03, ″.03*, ″.02, ″.03, ″.05, ″.06.

No. 17.—*Fifth bar wrought-iron B.*

Diameter, 1″. Speed of rotation, 400 per minute. Distance between end bearings, 33″. Deflections measured on chord of 10 inches.

Maximum. fiber stress per squareinch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
0	0	0	*a*	.2104					
			b	.2111					
			c	.2107					
40,000	0	0	*a*	.2104	.1803	.2100	.0297	.0004	
			b	.2113	.1801	.2104	.0303	.0009	
			c	.2110	.1799	.2096	.0297	.0014	
40,000	11,000	11,000	*a*	.1933	.1869	.1929	.0060?	.0004	
			b	.2118	.1720	.2031	.0311	.0087	
			c	.2273	.1822	.2126	.0304	.0147	
40,000	0	11,000	*a*	.2074	.1736	.2038	.0302	.0036	Rested 15 hours unloaded.
			b	.2134	.1786	.2088	.0302	.0046	
			c	.2172	.1822	.2126	.0304	.0046	
20,000	0	11,000	*a*	.2074	.1909	.2062	.0153	.0012	Load reduced.
			b	.2123	.1963	.2114	.0151	.0009	
			c	.2143	.1988	.2139	.0151	.0004	
20,000	9,600	20,600	*a*	.2063	.1908	.2040	.0132?	.0023	
			b	.2117	.1960	.2112	.0152	.0005	
			c	.2147	.1991	.2142	.0151	.0005	
40,000	0	20,600	*a*	.2065	.1731	.2133	.0302	.0032	Load increased.
			b	.2126	.1779	.2085	.0306	.0041	
			c	.2181	.1824	.2127	.0303	.0054	
40 000	9,400	30,000	*a*	.2164	.1736	.2056	.0320	.0108	
			b	.2241	.1810	.2119	.0309	.0122	
			c	.2082	.1664	.1981	.0317	.0101	
40,000	0	30,000	*a*	.2162	.1792	.2095	.0303	.0067	Rested 1 hour unloaded.
			b	.2204	.1837	.2138	.0301	.0066	
			c	.2053	.1682	.1989	.0307	.0063	

40,000	5,000	35,000	a	.2259	.1823	.2137	.0314	.0123		
			b	.2056	.1715	.2024	.0309	.0032		
			c	.2120	.1739	.2060	.0311	.0070		
40,000	5,000	40,000	a	.2270	.1812	.2197	.0325	.0133	Bar ruptured.	
			b	.2089	.1741	.2053	.0312	.0036		
			c	.2091	.1712	.2031	.0319	.0060		

TEST No. 18.—*First wrought-iron bar C.*

Shafts marked *c* were turned down from hot-rolled iron 1½″ diameter.

Tensile tests made on full-sized bars gave the following results—the mean of three tests:

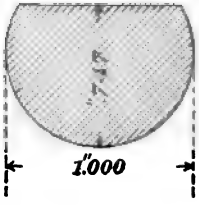
Elastic limit per square inch	pounds..	30,670
Tensile strength per square inch	do....	49,660
Elongation in 30 inches	per cent..	22.4
Contraction of area	do....	28.5
Appearance of fractures	fibrous, with traces of granulation	

The shaft was tested under a constant load of 40,000 pounds per square inch, and was kept at the temperature 70° Fahr. by means of a stream of cold water playing upon it.

The test was discontinued after 50,000 rotations, although the shaft wabbled after 48,000 rotations, and it is very probable that a crack was then developing.

The crack as it existed at the close of the test extended over 120 degrees of arc on the side *c*, stopping on the surface at some longitudinal seams in the iron.

The metal was planed off along side *c* to remove the fractured metal, and the bar then tested by direct tension as follows:



Present sectional area, .629 square inch.

Gauged length (symmetrical with middle bearing of rotating test), 5″

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
629	1,000	0.	0.	Initial load.
3,145	5,000	.0006	.....	
6,290	10,000	.0016	.....	
9,435	15,000	.0026	0.	
12,580	20,000	.0036	.....	
13,209	21,000	.0039	.....	
13,838	22,000	.0041	.....	
14,467	23,000	.0044	.....	
15,096	24,000	.0047	.....	
15,725	25,000	.0049	.0006	Elastic limit.
16,354	26,000	.0054	.....	
16,983	27,000	.0059	.....	
17,612	28,000	.0064	.....	
18,241	29,000	.0069	.....	
18,870	30,000	.0083	.0031	
19,499	31,000	.0116	.....	
20,128	32,000	.0149	.....	
20,757	33,000	.0201	.....	
21,386	34,000	.0272	.....	
22,015	35,000	.0358	.0288	
22,644	36,000	.0438	.....	Fine surface cracks in sight
23,273	37,000	.0623	.....	
23,902	38,000	.0765	.....	
24,531	39,000	.0930	.....	
25,160	40,000	.1125	.....	
25,789	41,000	.14	.....	
26,418	42,000	.16	.....	
27,047	43,000	.20	.....	
27,676	44,000	.22	.....	
28,305	45,000	.255	.....	
28,934	46,000	.30	.....	
29,563	47,000	.36	.....	
30,192	48,000	.44	.....	
30,480	48,460	.....	.....	Tensile strength.
0	0	.57	.....	=11.4 per cent.

Fractured at point near middle bearing when rotating, at a place where a crack was in sight, at 36,000 pounds per square inch tension.

Appearance, fibrous.

The crack above mentioned, and which appeared to locate the place of fracture, was evidently formed by the transverse stress of the rotating test; it measured on the fractured section ″.22 long by ″.08 deep; here the metal was darker colored and had a smooth surface.

Elongation of inch sections (on original 10″ length line), ″.12, ″.10, ″.10, ″.09, ″.06, ″.24*, ″.07, ″.10, ″.10, ″.12.

No. 18.—*First wrought-iron bar C.*

Diameter, 1″. Speed of rotation, 400 per minute. Distance between end bearings, 33″. Deflections measured on chord of 10 inches.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
40,000	0	0	*a*	.1996	.1662	.1976	.0314	.0020	
			b	.2000	.1664	.1976	.0312	.0024	
			c	.2012	.1657	.1972	.0315	.0040	
40,000	10,000	10,000	*a*	.2060	.1629	.1954	.0325	.0106	
			b	.2005	.1626	.1948	.0322	.0057	
			c	.2035	.1636	.1957	.0321	.0078	
40,000	10,000	20,000	*a*	.1941	.1608	.1934	.0326	.0007	
			b	.2009	.1634	.1953	.0319	.0056	
			c	.2049	.1646	.1966	.0320	.0083	
40,000	10,000	30,000	*a*	.2032	.1635	.1955	.0320	.0077	
			b	.2035	.1640	.1961	.0321	.0074	
			c	.2023	.1631	.1954	.0323	.0069	
40,000	10,000	40,000	*a*	.1968	.1618	.1944	.0326	.0024	
			b	.2030	.1640	.1963	.0323	.0087	
			c	.2022	.1634	.1955	.0321	.0067	
40,000	0	40,000	*a*	.2022	.1637	.1961	.0324	.0061	Rested 1½ hours unloaded.
			b	.2028	.1646	.1966	.0320	.0062	
			c	.2016	.1632	.1955	.0323	.0061	
40,000	10,000	50,000	*a*	.2016	.1635	.1968	.0333	.0048	
			b	.1960	.1584	.1914	.0330	.0046	
			c	.2052	.1558	.1910	.0352	.0142	
									Bar ruptured.

TEST NO. 19.—*Second wrought-iron bar C.*

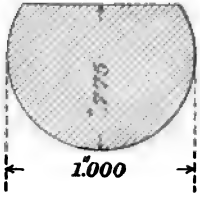
The shaft was run without water. It acquired a temperature of about 120° Fahr.

At 42,000 rotations it wabbled badly.

The test was discontinued at 43,600 rotations, at which time a crack was visible ″.85 from the middle bearing toward the driven end, extending over 110 degrees of arc on the side of the shaft which was between the lines *b* and *c*.

The crack stopped on the surface of the shaft at some longitudinal seams in the iron.

This side was planed off and rupture completed by direct tension, as shown by the following results:



Present sectional area, .653 square inch.

Gauged length (symmetrical with original 10″ section), 5″.

Applied loads.		In gauged length.		Remarks.
Total.	Per square inch.	Elongation.	Set.	
Pounds.	*Pounds.*	*Inch.*	*Inch.*	
653	1,000	0.	0.	Initial load.
3,265	5,000	.0007	.....	
6,530	10,000	.0017	.....	
9,795	15,000	.0027	0.	
13,060	20,000	.0037	.....	
13,713	21,000	.0040	.....	
14,366	22,000	.0041	.....	
15,019	23,000	.0043	.....	
15,672	24,000	.0048	.....	
16,325	25,000	.0050	.0005	Elastic limit (not well defined).
16,978	26,000	.0055	.....	
17,631	27,000	.0059	.....	
18,284	28,000	.0062	.....	
18,937	29,000	.0066	.....	
19,590	30,000	.0076	.0022	
20,243	31,000	.0096	.....	
20,896	32,000	.0113	.....	
21,549	33,000	.0153	.....	
22,202	34,000	.0218	.....	
22,855	35,000	.0295	.....	
23,508	36,000	.0395	.....	
24,161	37,000	.0550	.....	
24,814	38,000	.0720	.....	
25,467	39,000	.0945	.....	
26,120	40,000	.....	.....	Tensile strength.
0	0	.19	.....	= 3.8 per cent.

Fracture occurred in detail, tearing apart from the flattened face. The fractured surface showed that a part of the crack made by the rotating test remained and was not removed when planing off the flattened side.

The crack appeared to extend from ″.01 to ″.06 beyond the metal removed.

A transverse crack opened ″.55 from the place of rupture, measuring ″.4 on the surface of the bar. A number of small cracks were developed in this vicinity. The metal was fibrous at the fracture.

Elongation of inch sections, ″.04, ″.03, ″.03, ″.06*, ″.07, ″.01, ″.02, ″.02, ″.04, ″.03.

No. 19.—*Second wrought-iron bar C.*

Diameter, 1″. Speed of rotation, 400 per minute. Distance between end bearings, 33″. Deflections measured on chord of 10 inches.

Maximum fiber stress per square inch.	Number of rotations.		Micrometic readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
40,000	0	0	*a*	.1980	.1652	.1963	.0311	.0026	
			b	.1990	.1657	.1967	.0310	.0032	
			c	.2015	.1668	.1980	.0312	.0035	
40,000	10,000	10,000	*a*	.1936	.1603	.1926	.0323	.0010	
			b	.2052	.1643	.1964	.0321	.0088	Temperature about 120° Fahr.
			c	.2028	.1647	.1969	.0322	.0059	
40,000	0	10,000	*a*	.1997	.1651	.1967	.0316	.0030	Bar rested 15 hours unloaded.
			b	.2018	.1668	.1984	.0316	.0034	
			c	.2002	.1655	.1973	.0318	.0029	
40,000	10,000	20,000	*a*	.1984	.1627	.1951	.0324	.0033	
			b	.2035	.1647	.1971	.0324	.0064	
			c	.2014	.1648	.1968	.0320	.0046	
40,000	10,000	30,000	*a*	.1974	.1628	.1952	.0324	.0022	
			b	.1985	.1633	.1957	.0324	.0028	
			c	.2036	.1647	.1970	.0323	.0066	
40,000	10,000	40,000	*a*	.2005	.1634	.1963	.0329	.0042	
			b	.2031	.1642	.1968	.0326	.0063	
			c	.2005	.1634	.1950	.0325	.0046	
40 000	3,600	43,600	.....	.....	.....	.....	.....	.....	Bar ruptured.

TEST NO. 20.—*Third wrought-iron bar C.*

The shaft was loaded with 40,000 pounds per square inch fiber stress, and run until a crack was developed, after which the shaft was straightened and run under reduced loads until rupture was completed.

While running under 40,000 pounds per square inch fiber stress, observations were made on the total deflection between end bearings by means of a micrometer mounted on the cross-bar below the shaft, as follows:

Total number of rotations.	Total deflection.	Remarks.
	Inch.	
0	.2840	Shaft at rest.
400	.2860	Shaft rotating when this and the following readings were taken.
2,000	.2875	
4,000	.2870	
8,000	.2860	
10,000	.2856	Shaft hot—120° Fahr.
20,000	.2850	
21,000	.2840	
22,000	.2850	
26,000	.2840	
30,000	.2840	
		No material difference in deflections between 30,000 and 60,000 rotations.
62,000	.2840	
62,000	.2830	Shaft at rest. Rested 15 hours unloaded.
62,000	.2500	Shaft at rest.
62,050	.2710	Shaft running again.
64,000	.2750	
66,000	.2775	
70,000	.2780	
76,000	.2800	
80,000	.2810	
84,000	.2815	
86,000	.2830	
88,000	.2845	
90,000	.2865	Shaft wabbles badly.
92,000	.2895	
94,000	.2930	
95,000	.2960	Test discontinued.

Shaft examined, and a crack found one-half inch from the middle bearing toward the driven end, and extending over 120 degrees of arc on the side *c*.

The shaft was straightened by bending and peining the surface, operating at a distance from the crack already found, after which the rotating test was continued under reduced loads.

The fiber stress under the reduced loads is computed as though the shaft was not cracked.

After 150,000 rotations under reduced loads, the extent of the crack was apparently unchanged.

Under the final load, 19,000 pounds per square inch, the shaft wabbled badly, the crack was observed to extend, and finally rupture was complete.

No. 20.—*Third wrought-iron bar C.*

Diameter, 1″. Speed of rotation, 400 per minute. Distance between end bearings, 33″. Deflections measured on chord of 10 inches.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
0	0	0	*a*	.1991	.....	.....	.....	.....	
			b	.1992	.....	.....	.....	.....	
			c	.1988	.....	.....	.....	.....	
40,000	95,000	95,000	.....	.....	.....	.....	.....	.....	Crack developed ¼″ eccentric. Bar straightened by bending and peining, operating upon the opposite side of the middle bearing from the crack. Bar now run under reduced loads.
15,000	0	0	*a*	.1078	.1842	.1968	.C126	.0010	
			b	.1991	.1864	.1987	.0123	.0004	
			c	.2012	.1872	.2008	.0136	.0004	
15,000	50,000	50,000	*a*	.1968	.1839	.1967	.0128	.0001	
			b	.1992	.1864	.1988	.0124	.0004	
			c	.2012	.1873	.2009	.0136	.0003	
16,000	50,000	100,000	*a*	.1968	.1828	.1966	.0138	.0002	
			b	.1992	.1855	.1980	.0134	.0003	
			c	.2014	.1866	.2011	.0145	.0003	
17,000	50,000	150,000	*a*	.1970	.1819	.1967	.0148	.0003	
			b	.1991	.1847	.1989	.0142	.0002	
			c	.2016	.1858	.2013	.0155	.0003	
18,000	50,000	200,000	*a*	.1946	.1804	.1964	.0160	0.	
			b	.1989	.1831	.1987	.0156	.0002	
			c	.2020	.1853	.2016	.0163	.0004	
19,000	43,300	243,300	.....	.....	.....	.....	.....	.....	Bar ruptured.

TEST No. 21.—*Fourth wrought-iron bar C.*

The shaft was first loaded with 15,000 pounds per square inch fiber stress.

The loads were increased by increments of 5,000 pounds per square inch, 10,000 rotations being made under each load until 40,000 pounds per square inch were reached.

The shaft was run under the latter load until ruptured, which occurred after making 116,567 rotations.

The temperature of the shaft was sensibly increased after 40,000 rotations, and reached about 150° Fahr. at 50,000 turns.

Observations on the total deflection between end bearings showed no substantial difference, whether the shaft was slowly turned or run at the full speed of 700 rotations per minute, up to the time of making an observation at 50,000 total rotations, while the shaft was under 35,000 pounds per square inch.

The deflection now appeared to be ".6040 less while running at full speed than the deflection while slowly turned.

Subsequent measurements taken while the shaft was loaded with 40,000 pounds per square inch, showed the following differences in the same direction as above noted:

Total number of rotations.	Difference in total deflection.
	Inch.
60,000	.0070
70,000	.0050
80,000	.0050
90,000	.0040
100,000	.0020
110,000	.0030

The shaft wabbled badly near the close of the test, and reached a maximum temperature of about 180° Fahr.

No. 21.—*Fourth wrought-iron bar C.*

Diameter, 1″. Speed of rotation, 700 per minute. Distance between end bearings, 33″. Deflections measured on chord of 10 inches.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
15,000	0	0	*a*	.1991	.1872	.1990	.0118	.0001	
			b	.1992	.1872	.1990	.0118	.0002	
			c	.1995	.1875	.1994	.0119	.0001	
15,000	10,000	10,000	*a*	.1992	.1871	.1990	.0119	.0002	
			b	.1992	.1872	.1991	.0119	.0001	
			c	.1995	.1876	.1994	.0118	.0001	
20,000	0	10,000	*a*	.1992	.1830	.1991	.0161	.0001	
			b	.1993	.1829	.1990	.0161	.0003	
			c	.1996	.1835	.1993	.0158	.0003	
20,000	10,000	20,000	*a*	.1992	.1830	.1990	.0160	.0002	
			b	.1992	.1828	.1989	.0161	.0003	
			c	.1997	.1835	.1994	.0159	.0003	
25,000	0	20,000	*a*	.1991	.1789	.1989	.0200	.0002	
			b	.1993	.1787	.1988	.0201	.0005	
			c	.1998	.1793	.1993	.0200	.0005	
25,000	10,000	30,000	*a*	.1986	.1783	.1983	.0200	.0003	
			b	.1992	.1782	.1984	.0202	.0008	
			c	.2003	.1791	.1990	.0199	.0013	
30,000	0	30,000	*a*	.1994	.1740	.1980	.0240	.0014	
			b	.1998	.1738	.1978	.0240	.0020	
			c	.2007	.1747	.1986	.0239	.0021	
30,000	10,000	40,000	*a*	.2000	.1730	.1971	.0241	.0029	
			b	.2015	.1735	.1971	.0236	.0044	
			c	.2008	.1738	.1980	.0242	.0028	
35,000	0	40,000	*a*	.2000	.1683	.1962	.0279	.0038	
			b	.2012	.1672	.1958	.0286	.0054	
			c	.2025	.1685	.1963	.0278	.0062	
35,000	10,000	50,000	*a*	.2025	.1685	.1969	.0284	.0056	
			b	.1984	.1671	.1955	.0284	.0029	
			c	.2031	.1694	.1978	.0284	.0053	
40,000	0	50,000	*a*	.2012	.1627	.1950	.0323	.0062	
			b	.2017	.1620	.1944	.0324	.0073	
			c	.2034	.1631	.1954	.0328	.0080	
40,000	66,567	116,567	.....	.....	.....	.....	.....	.....	Shaft ruptured.

TEST NO. 22.—*Fifth wrought-iron bar C.*

Observations made on this shaft showed the following differences between the total deflections while slowly turned and while running at full speed, the shaft deflecting less by these amounts when at full speed.

Fiber stress on the shaft, 40,000 pounds per square inch.

Total number of rotations.	Difference in total deflection.	Remarks.
	Inch.	
5,000	.0080	Temperature of shaft about 105° Fahr.
10,000	.0080	Temperature of shaft about 150° Fahr.
15,000	.0060	Do.
20,000	.0050	
25,000	.0040	
30,000	.0040	
35,000	.0040	
40,000	.0050	
45,000	.0040	
50,000	.0020	
		Rotations stopped 10 minutes while deflections were measured on chord of 10 inches.
55,000	.0020	
60,000	.0020	
65,000	0.	
70,000	0.	
75,000	0.	
		Load on shaft increased to 45,000 pounds per square inch.
76,000	.0120	
80,000	.0100	
85,000	—.0050	
90,000	—.0020	Temperature of shaft about 200° Fahr.

The last two readings showed greater deflections under full speed than when slowly turned.

No. 22.—*Fifth bar wrought-iron C.*

Diameter, 1″. Speed of rotation, 700 per minute. Distance between end bearings, 33″. Deflections measured on chord of 10 inches.

Maximum fiber stress per square inch.	Number of rotations.		Micrometer readings for deflections.				Deflections.	Sets.	Remarks.
	Successive.	Total.	On line.	Unloaded.	Loaded.	Unloaded.			
Pounds.				*Inch.*	*Inch.*	*Inch.*	*Inch.*	*Inch.*	
40,000	0	0	*a*	.1982	.1656	.1972	.0316	.0010	
			b	.1986	.1650	.1970	.0320	.0016	
			c	.1999	.1660	.1980	.0320	.0019	
40,000	50,000	50,000	*a*	.2003	.1621	.1953	.0332	.0050	
			b	.1965	.1600	.1934	.0334	.0031	
			c	.2029	.1632	.1962	.0330	.0067	
40,000	25,000	75,000	*a*	.1980	.1614	.1946	.0332	.0043	
			b	.1979	.1610	.1943	.0333	.0036	
			c	.2025	.1632	.1958	.0326	.0067	
45,000	0	75,000	*a*	.2002	.1566	.1938	.0372	.0064	
			b	.2012	.1564	.1939	.0375	.0073	
			c	.2028	.1573	.1946	.0373	.0082	
45,000	17,435	92,435	.....	.....	.....	.....	.....	.....	Shaft ruptured.

Some special experiments were made upon steel bars, rectangular in cross-section, for the purpose of illustrating the introduction of internal strains in bent bars, and supplying further data upon questions bearing upon the endurance of shafts under repeated stresses.

The rectangular section was used in order to obtain more metal exposed to the maximum stresses when loaded transversely than is obtained with circular section.

Strips 1″ to 1¾″ wide, cut off a $\frac{7}{16}$″ plate of open hearth boiler steel, were bent cold into the shapes shown in the details.

The distance between two data points established on the strips, or on pieces of metal attached to the strips, were measured, after which portions of the metal of the strips at the bends were planed or drilled away.

This metal was removed in successive stages, and the effect on the strip determined by the changes in the distance between the data points.

An examination of the results will show that when the bent strips were planed off on the convex side of the bend, the first tendency of the strip was to straighten itself, which tendency existed until a certain depth of metal had been removed, after which the movement of the ends of the strip were reversed, and assumed a more bent shape as additional metal was removed. This was shown by strip No. 1.

Strip No. 2 was bent in a similar manner to No. 1, but in planing away the metal it was taken from the concave side of the bend.

The movement of the ends, however, took place in the same direction as in No. 1; that is, the first tendency was to straighten, and afterward to assume a state of greater deflection.

In No. 3 a row of holes was drilled along the center line; the effect on the length of the strip was very slight.

In No. 4 a curved row of holes was drilled along the center line at the bend, causing the ends of the strip to approach each other ″.0013. Then planing off $\frac{1}{16}$″ of metal on the convex side of the bend, the ends opened ″.0004; planing off $\frac{1}{16}$″ from the concave side, the ends opened the additional amount of ″.0073.

In No. 5 the successive movements of the ends of the pieces riveted to the strip are shown, after successive depths of metal have been planed off.

Here we note the same movements displayed by the more bent strips; the outside ends of the riveted pieces first increase their distance apart until $\frac{3}{16}$″ depth of metal has been removed, after which the ends begin to close, and when $\frac{5}{16}$″ has been removed the ends are ″.0018 nearer each other than originally.

As more metal is planed away, the ends of the riveted pieces continue to close until they reach ″.0471 at $\frac{7}{16}$″ depth of cut.

Continuing the depth of cut, the ends of the riveted pieces again change direction, and once more increase their distance apart. When the cut had reached a depth of $\frac{9}{16}$″, the distance between the ends was ″.0079 greater than originally.

In planing the cuts in these strips, the precaution was taken use a fine feed for the tool and a light chip, an inquiry into the eff of the planer tool on strains in the metal having been suggested, not yet investigated.

No. 6 gave results similar to No. 1.

No. 7 gave results similar to No. 5, except it did not show any te ency to reverse the direction of the movement of the ends of the riv pieces a second time.

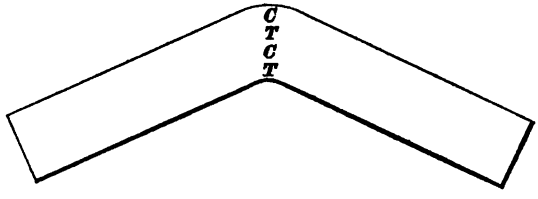
That feature which was pronounced in No. 5 will be made the subject of further investigation.

In No. 7 the riveted pieces being on the convex side of the strip, their movements appear contrary to the corresponding movements of No. 5.

These experiments, although incomplete, were successful in showing the introduction of initial strains in bent bars.

The disposition of the strains in these strips as indicated by their movements seem to be as follows:

The metal on the convex side of the bend near the surface is in a state of initial compression; at a certain depth are found tensile strains, beyond which we again meet compressive strains, and again near the concave surface of the bend, tensile strains; as shown on the following sketch by representing tensile strains by the letter *T*, and compression strains by *C*.



This disposition of internal strains appears to explain the observed movements of the several strips.

Strip No. 1.

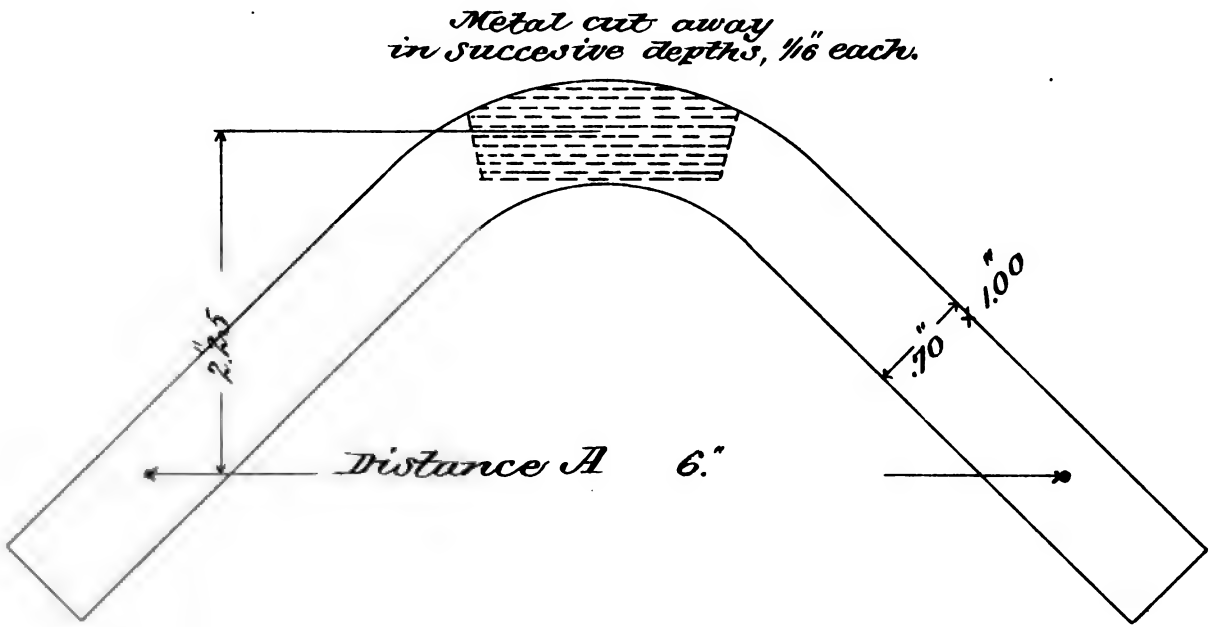
Bent cold 90 degrees. The outside of the bend planed off in successive depths $\frac{1}{16}$" each, taking light cuts with the planer tool.

The distance across the legs measured after each cut.

When $\frac{1}{4}$" had been planed off the convex side, the cuts were confined by the radial lines 1".75 apart at their outer extremities.

Depth of cut.	Change in distance A.			
	Increase.		Decrease.	
	Successive.	Total.	Successive.	Total.
Inch.	*Inch.*	*Inch.*	*Inch.*	*Inch.*
$\frac{1}{16}$	.0007	.0007	.....	.....
$\frac{2}{16}$	.0010	.0017	.....	.....
$\frac{3}{16}$	.0010	.0027	.....	.....
$\frac{4}{16}$	.0006	.0033	.....	.....
$\frac{5}{16}$	0.	.0033	.....	.....
$\frac{6}{16}$	.....	.0013	.0020	.....
$\frac{7}{16}$	.....	.....	.0070	.0057
$\frac{8}{16}$	.....	.....	.0095	.0152
$\frac{9}{16}$	.....	.....	.0088	.0240
$\frac{10}{16}$	.....	.....	.0081	.0321
$\frac{11}{16}$	.....	.....	.0032	.0353

Strip No. 1



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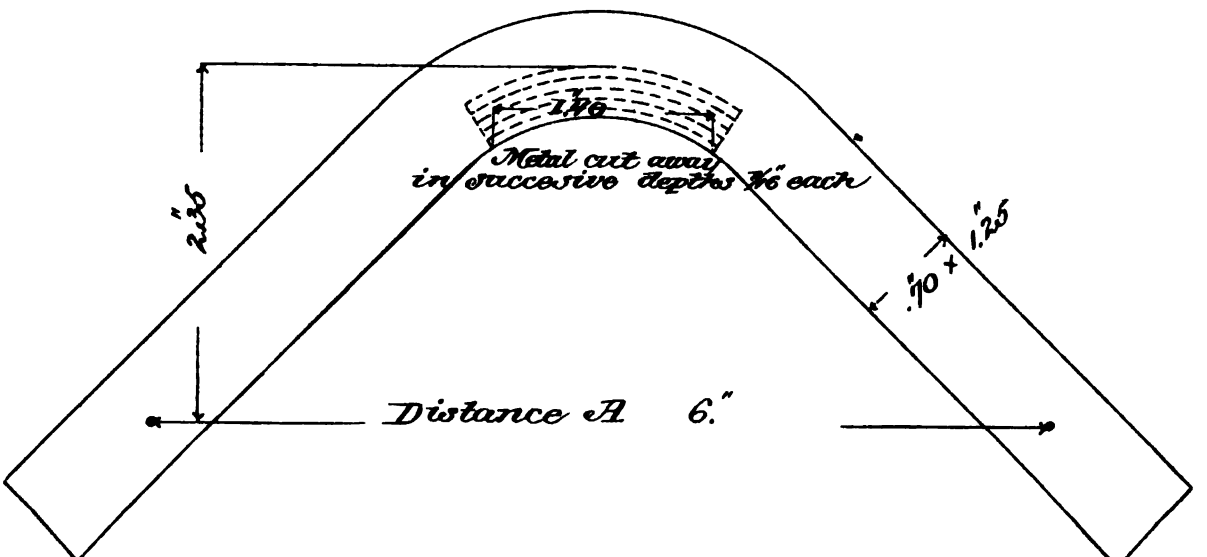
Strip No. 2



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Strip No. 2.

Bent cold 90 degrees. The inside of the bend planed in successive depths of $\frac{1}{16}$'' each.

Depth of cut.	Change in distance A.			
	Increase.		Decrease.	
	Successive.	Total.	Successive.	Total.
Inch.	*Inch.*	*Inch.*	*Inch.*	*Inch.*
$\frac{1}{16}$	.0098	.0098	.....	.....
$\frac{2}{16}$	.0006	.0104	.....	.....
$\frac{3}{16}$	.....	.0042	.0062	.....
$\frac{4}{16}$	.....	.....	.0195	.0153
$\frac{5}{16}$	.....	.....	.0070	.0223

STRIP No. 3.

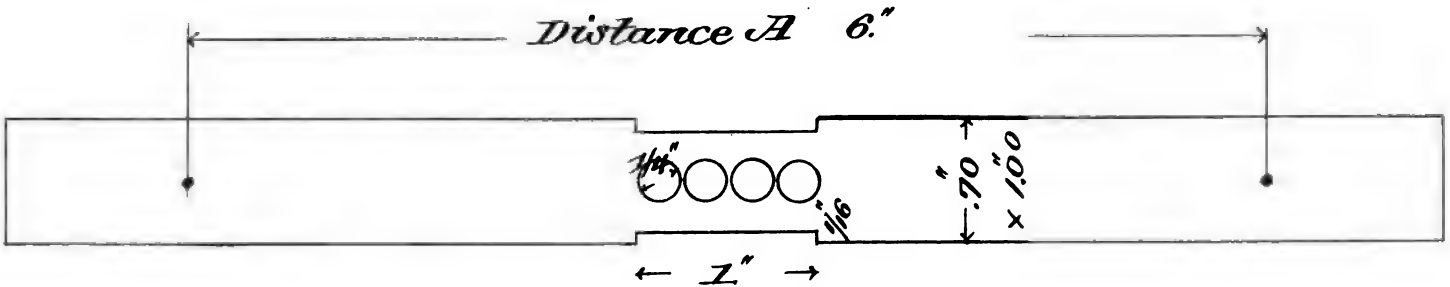
Bent cold in opposite directions, six times each, the strips taking a set of ″.10 in 7″.25 between end supports at each bend, then nearly straightened by an additional bend of less extent.

Distance A laid off on center line of strip, after which a row of four ¼″ holes was drilled along the center line.

Distance A before holes were drilled	inches	6.0022
Distance A after holes were drilled	do	6.0027
Increase	do	.0005

One-sixteenth inch of metal planed off each side of the strip a length of 1 inch; the distance A not appreciably changed.

Strip No. 3



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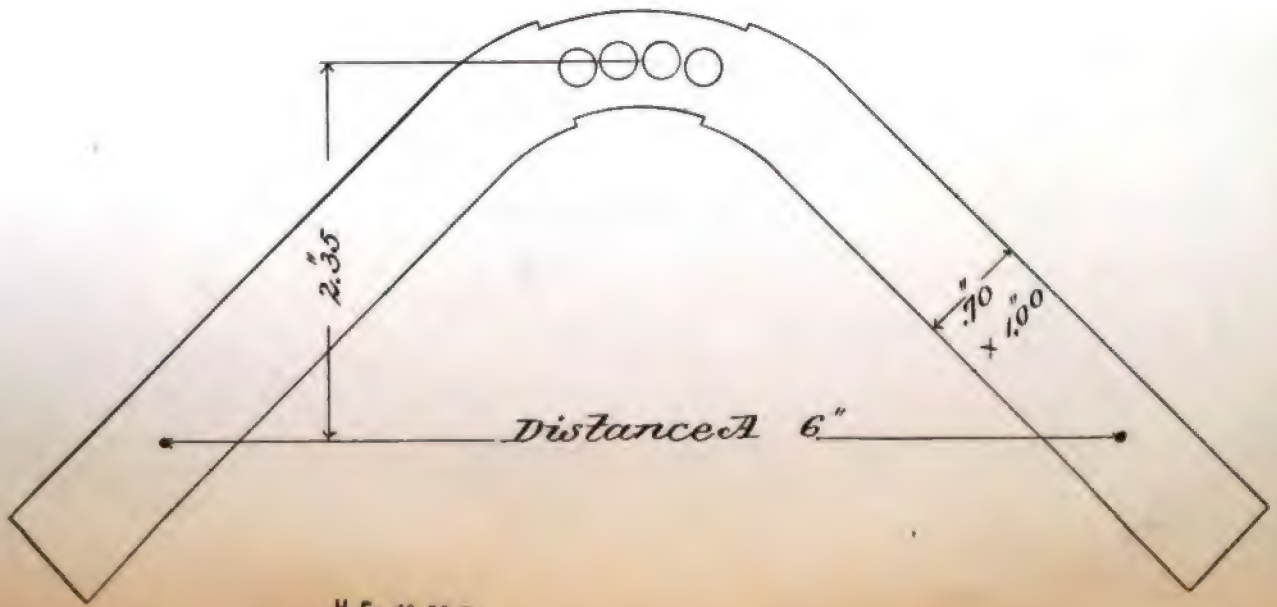
Strip No. 4



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STRIP No. 4.

Bent cold 90 degrees. Distance A established on legs of strip, then a curved row of four $\frac{1}{4}''$ holes was drilled along the center line of the bend.

Distance A before holes were drilled	inches..	6.0050
Distance A after holes were drilled	do....	6.0037
Decrease	do....	.0013

One-sixteenth inch depth of metal was next planed off the convex side of the bend; distance A now measures 6".0041. Increase since the last reading, ".0004.

One-sixteenth inch depth of metal planed off the concave side of the bend; distance A now measures 6".0114. Increase since the last reading, ".0073.

STRIP NO. 5.

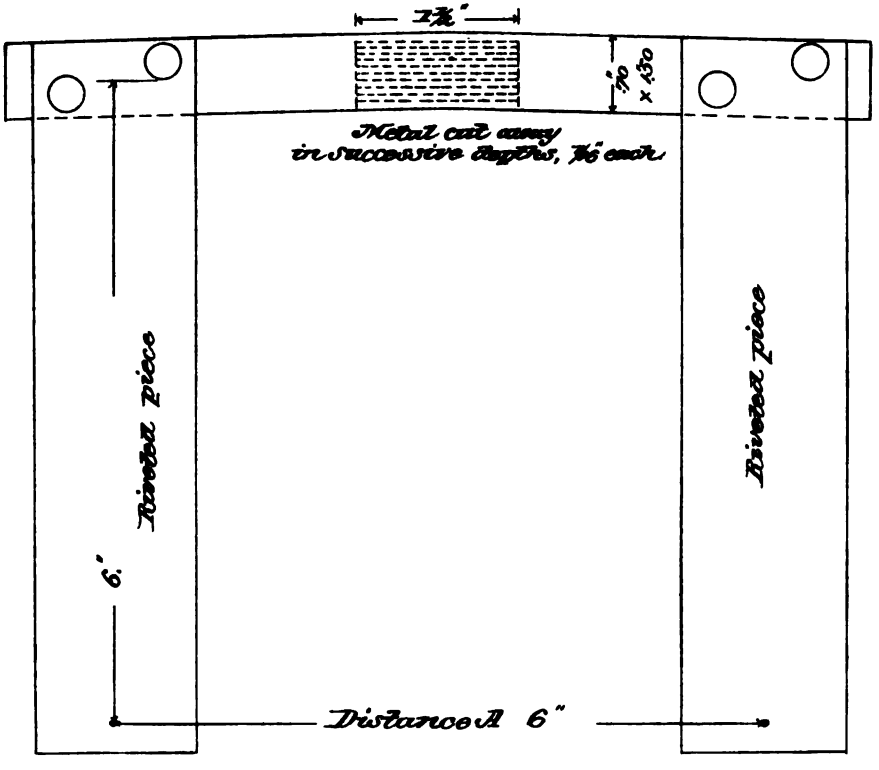
Bent cold in opposite directions the same amount and number of times given No. 3, except the bending for final straightening was omitted in the present case.

Pieces were riveted on the bent strip projecting from the convex side of the bend; distance A established on these riveted pieces 6″ from the center line of the bent strip.

Metal from the convex side was planed off in successive depths, and the distance A measured as follows:

Depth of cut.	Change in distance A.			
	Increase.		Decrease.	
	Successive.	Total.	Successive.	Total.
Inch.	*Inch.*	*Inch.*	*Inch.*	*Inch.*
1/16	.0075	.0075	.....	.....
1/8	.0051	.0126	.....	.....
3/16	.0018	.0144	.....	.....
1/4	.....	.0115	.0029	.....
5/16	.....	.....	.0133	.0018
3/8	.....	.....	.0359	.0377
7/16	.....	.....	.0094	.0471
1/2	.0045	.....	.....	.0426
9/16	.0126	.....	.....	.0300
5/8	.0379	.0079	.....	.....

Strip No. 5



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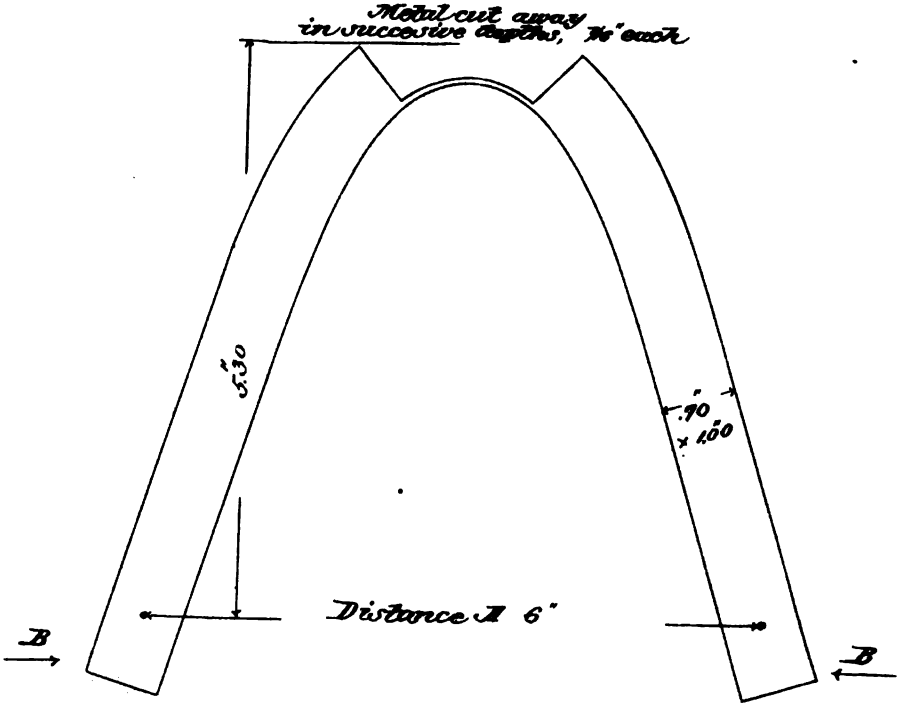
Strip No. 6



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STRIP No. 6.

Bent cold 145 degrees. The strip was bent 90 degrees by transverse load, then by pressure in the direction of the arrows B until the bend was completed.

Before releasing the load in direction B, the minimum distance across the extremities of the legs of the strip was 6″.62. After releasing the load the distance was 7″.04.

Resilience, ″.42.

Metal cut away on the convex side of the bend, and distance A measured as follows:

Depth of cut.	Change in distance A.			
	Increase.		Decrease.	
	Successive.	Total.	Successive.	Total.
Inch.	*Inch.*	*Inch.*	*Inch.*	*Inch.*
1/32	.0034	.0034	.....	.....
2/32	.0024	.0058	.....	.....
3/32	.....	.0055	.0003	.....
4/32	.....	.0016	.0039	.....
5/32	.....	.....	.0189	.0173
6/32	.....	.....	.0378	.0551
7/32	.....	.....	.0445	.0996
8/32	.....	.....	.0049	.1045
9/32	.....	.....	.0028	.1073
10/32	.....	.....	.0080	.1153
.35	.0040	.....	.....	.1113

Strip No. 7.

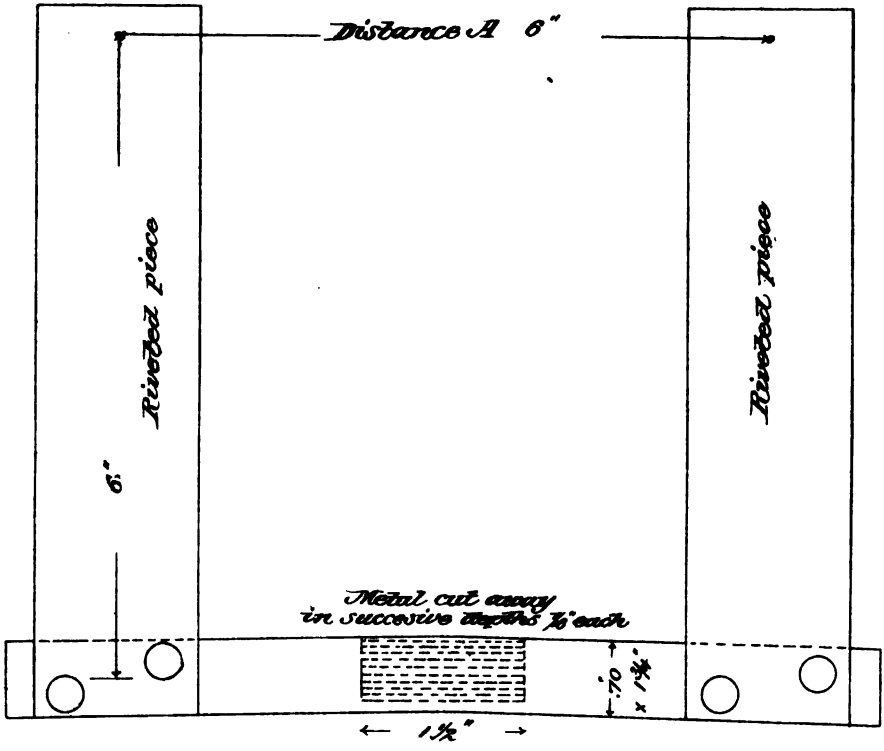
Bent cold once, giving the metal a set of ".11 in a length of 11".

Pieces riveted on strip, the ends projecting on the convex side of the bend.

Metal cut away on the convex side, and distance A measured as follows:

Depth of cut.	Change in distance A.			
	Increase.		Decrease.	
	Successive.	Total.	Successive.	Total.
Inch.	*Inch.*	*Inch.*	*Inch.*	*Inch.*
1/16	.....	.....	.0037[a]	.0037
1/8	.....	.....	.0011	.0048
3/16	.0025	.....	.....	.0023
1/4	.0190	.0167	.....	.....
5/16	.0206	.0373	.....	.....
3/8	.0109	.0482	.....	.....
7/16	.0051	.0533	.....	.....
1/2	.0024	.0557	.....	.....
9/16	.0366	.0923	.....	.....
5/8	.0277	.1200	.....	.....
.65	.14	.26	.....	.....

Strip No. 7



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ENDURANCE TESTS OF ROTATING SHAFTS.—GENERAL TABULATION OF RESULTS.

No. of test.	Material.	Marks.	Speed of rotation per minute.	Maximum fiber stress per square inch.	Number of rotations.		Remarks.
					Successive.	Total.	
				Pounds.			
1	O. H. steel	1-833	400	20,000	200,000	200,000	
				21,000	200,000	400,000	
				22,000	200,000	600,000	
				23,000	200,000	800,000	
				24,000	200,000	1,000,000	
				25,000	250,000	1,250,000	
				26,000	150,000	1,400,000	
				27,000	200,000	1,600,000	
				28,000	200,000	1,800,000	
				29,000	200,000	2,000,000	
				30,000	200,000	2,200,000	
				31,000	302,000	2,502,000	
				30,000	131,000	2,633,000	After making 3,002,000 rotations bar was examined and a crack found extending around 140 degrees. The crack was ".55 from the middle of the length of the bar towards the ball and socket end.
				20,000	219,000	2,852,000	
				21,000	100,000	2,952,000	
				22,000	83,500	3,035,500	
2	O. H. steel	2-123	400	35,857	497,100	497,100	Bar ruptured.
3	....do	2-123	700	25,000	100,000	100,000	
				26,000	100,000	200,000	
				27,000	100,000	300,000	
				28,000	100,000	400,000	
				29,000	100,000	500,000	
				30,000	100,000	600,000	
				31,000	100,000	700,000	
				32,000	100,000	800,000	
				33,000	100,000	900,000	
				34,000	100,000	1,000,000	
				35,000	100,000	1,100,000	
				36,000	100,000	1,200,000	
				37,000	13,400	1,213,400	Bar ruptured.
4	O. H. steel	3-782	400	35,857	1,100,000	1,100,000	
							Bar rested 32 days.
				38,000	200,000	1,300,000	
				39,000	200,000	1,500,000	
				40,000	202,000	1,702,000	
				41,000	198,000	1,900,000	
				42,000	200,000	2,100,000	
				43,000	133,160	2,233,160	

ENDURANCE TESTS OF ROTATING SHAFTS.—GENERAL TABULATION OF RESULTS—Continued.

No. of test.	Material.	Marks.	Speed of rotation per minute.	Maximum fiber stress per square inch.	Number of rotations.		Remarks.
					Successive.	Total.	
				Pounds.			
5	O. H. steel	4-795	400	30,000	100,000	100,000	
				32,000	100,000	200,000	
				34,000	100,000	300,000	
				36,000	100,000	400,000	
				38,000	100,000	500,000	
				40,000	100,000	600,000	
				42,000	100,000	700,000	
				44,000	105,940	805,940	
				46,000	94,060	900,000	
				48,000	20,000	920,000	
6	O. H. steel	5-803	1,350	30,000	10,000	10,000	
				40,000	10,000	20,000	
				50,000	120,000	140,000	
				55,000	40,000	180,000	
				60,000	59,000	239,000	Bar ruptured.
7	O. H. steel	7-823	400	30,000	100,000	100,000	
				35,000	100,000	200,000	
				40,000	100,000	300,000	
				45,000	100,000	400,000	
				50,000	100,000	500,000	Test discontinued.
8	O. H. steel	8-750	400	20,000	100,000	100,000	
				25,000	100,000	200,000	
				30,000	100,000	300,000	
				35,000	100,000	400,000	
				40,000	100,000	500,000	
				45,000	100,000	600,000	
				50,000	100,000	700,000	
				51,000	100,000	800,000	
				52,000	100,000	900,000	
				53,000	100,000	1,000,000	
				54,000	100,000	1,100,000	
				55,000	100,000	1,200,000	
				56,000	100,000	1,300,000	
				57,000	100,000	1,400,000	
				58,000	12,000	1,412,000	Bar ruptured.
9	Muck-bar tender axle No. 6	D	400	10,000	50,000	50,000	
				11,000	50,000	100,000	
				12,000	50,000	150,000	
				13,000	50,000	200,000	
				14,000	52,000	252,000	
				15,000	48,000	300,000	

				16,000	50,000	350,000	
				17,000	50,000	400,000	
				18,000	50,000	450,000	
				19,000	52,000	502,000	
				20,000	48,000	550,000	
				21,000	50,000	600,000	
				22,000	50,000	650,000	
				23,000	50,000	700,000	
				24,000	50,000	750,000	
				25,000	50,000	800,000	
				26,000	50,000	850,000	
				27,000	50,000	900,000	
				28,000	50,000	950,000	
				29,000	50,000	1,000,000	
				30,000	50,000	1,050,000	
				31,000	50,000	1,100,000	
				32,000	50,000	1,150,000	
				33,060	20,429	1,170,420	Bar ruptured.
10	Muck-bar tender axle No. 6.	E	400	33,000	50,000	50,000	
				34,000	50,000	100,000	
				35,000	47,800	147,800	Do.
11	Wrought iron L 208, unannealed.	C	400	20,000	100,170	100,170	
				22,000	99,830	200,000	
				24,000	100,000	300,000	
				26,000	100,000	400,000	
				28,000	100,000	500,000	
				30,000	100,000	600,000	
				32,000	100,000	700,000	
				34,000	100,000	800,000	
				36,000	100,000	900,000	
				38,000	100,000	1,000,000	
				40,000	100,000	1,100,000	
				42,000	30,300	1,130,300	Bar ruptured.
12	Wrought iron L 208, annealed.	F	400	20,000	100,000	100,000	
				21,000	100,000	200,000	
				22,000	100,000	300,000	
				23,000	100,000	400,000	
				24,000	100,000	500,000	
				25,000	100,000	600,000	
				26,000	100,000	700,000	
				27,000	100,000	800,000	
				28,000	100,000	900,000	
				29,000	100,000	1,000,000	
				30,000	100,000	1,100,000	
				31,000	100,000	1,200,000	
				32,000	96,650	1,296,650	Bar ruptured at a place about 1 inch eccentric on the end opposite the driving end.

ENDURANCE TESTS OF ROTATING SHAFTS.—GENERAL TABULATION OF RESULTS—Continued.

No. of test.	Material.	Marks.	Speed of rotation per minute.	Maximum fiber stress per square inch.	Number of rotations.		Remarks.
					Successive.	Total.	
				Pounds.			
13	Wrought iron	B	400	25,000	1,000,000	1,000,000	
				27,000	200,000	1,200,000	
				28,000	200,000	1,400,000	
				29,000	200,000	1,600,000	
				30,000	150,000	1,750,000	Crack in sight.
				30,000	35,750	1,785,750	
14	Wrought iron	B	400	40,000	43,135	43,135	Bar ruptured.
15	do	B	400	35,000	189,900	189,900	Do.
16	do	B	400	35,000	150,000	150,000	
17	do	B	400	40,000	11,000	11,000	
				20,000	9,600	20,600	
				40,000	19,400	40,000	
18	Wrought iron	C	400	40,000	50,000	50,000	Bar ruptured; crack visible.
19	do	C	400	40,000	43,600	43,600	Bar ruptured.
20	do	C	700	40,000	95,000	95,000	
							Crack developed. Bar straightened by bending and peining and then run under reduced loads.
				15,000	50,000	50,000	
				16,000	50,000	100,000	
				17,000	50,000	150,000	
				18,000	50,000	200,000	
				19,000	43,300	243,300	Bar ruptured.
21	Wrought iron	C	700	15,000	10,000	10,000	
				20,000	10,000	20,000	
				25,000	10,000	30,000	
				30,000	10,000	40,000	
				35,000	10,000	50,000	
				40,000	66,567	116,567	Do.
22	Wrought iron	C	700	40,000	75,000	75,000	
				45,000	17,435	92,435	Do.

PRIVATE TESTS.

[From July 1, 1887, to June 30, 1888.]

Date.	Material.	For whom tested.		
		Name.	City.	State.
1887.				
July 1	Wire rope	General E. W. Serrell	New York	N. Y.
2	....do	....do	....do	Do.
6	Brick pier	Norcross Bros	Boston	Mass.
6	Granite	Woodstock Granite Co	Baltimore	Md.
6	Aluminum bronze	Cowles, E. S. & Al. Co	Cleveland	Ohio.
7	....do	....do	....do	Do.
8	....do	....do	....do	Do.
11	....do	....do	....do	Do.
11	Steel plate	Charles E. Jacks	Boston	Mass.
15	Steel ribbon and tubes	Providence Cylinder Co	Providence	R. I.
18	Steel plates	Hinckley Locomotive Works.	Boston	Mass.
19	....do	Nashua Iron and Steel Co	....do	Do.
19	....do	E. D. Leavitt, jr	Cambridgeport	Do.
21	....do	....do	....do	Do.
21	....do	Nashua Iron and Steel Co	Boston	Do.
Aug. 2	Granite cubes	H. N. F. Marshall	Northfield	Do.
26	Marble cubes	F. T. Morton	Boston	Do.
26	Granite cube	Payson Tucker	Portland	Me.
27	....do	City of Boston	Boston	Mass.
Sept. 8	Brass and bronze	DeOxidized Metal Co	Bridgeport	Conn.
16	Terra-cotta lumber	New England Terra Cotta Lumber Co.	Boston	Mass.
17	Bricks	Boston Terra Cotta Co	....do	Do.
17	Wrought-iron column	E. Grinnell	New Bedford	Do.
19	Steel plate	Charles H. Allen	Lowell	Do.
19	Steel wires	General E. W. Serrell	New York	N. Y.
20	Steel axles	Simond's Rolling Machine Co.	Fitchburg	Mass.
21	....do	....do	....do	Do.
22	Steel axles and bars	....do	....do	Do.
23	....do	....do	....do	Do.
24	Cement stone	Otis E. Bowen	Highlandville	Do.
24	Aluminum bronze	Cowles, E. S. & Al. Co	Lockport	N. Y.
Oct. 6	Steel axles	Simond's Rolling Machine Co.	Fitchburg	Mass.
7	....do	....do	....do	Do.
22	Steel plates and iron	Charles H. Allen	Lowell	Do.
28	Aluminum bronze	Cowles, E. S. & Al. Co	Lockport	N. Y.
Nov. 1	Steel plate	Whittier Machine Co	Roxbury	Mass.
2	Aluminum bronze	Cowles, E. S. & Al. Co	Lockport	N. Y.
2	Marble cubes	F. T. Morton	Boston	Mass.
2	Sandstone	W. J. Sullivan	....do	Do.
2	Paving blocks	Boston Terra Cotta Co	....do	Do.
2	Cast iron	E. D. Leavitt, jr	Cambridgeport	Do.
3	....do	....do	....do	Do.
4	Electrically welded bars	Prof. A. E. Dolbear	College Hill	Do.
5	....do	....do	....do	Do.
7	Granite cubes	Hallowell Granite Co	Boston	Do.
7	Steel plate	Nashua Iron and Steel Co	....do	Do.
9	Steel plates	Whittier Machine Co	Roxbury	Do.
16	Welded bars	Prof. A. E. Dolbear	College Hill	Do.
21	Copper cylinder	Prof. J. E. Denton	Hoboken	N. J.
22	Steel bar	E. D. Leavitt, jr	Cambridgeport	Mass.
Dec. 8	Steel plate	Park, Bro. & Co	Boston	Do.
9	Steel pin	City of Boston	....do	Do.
14	Steel plates	Houdlette & Dunnels	....do	Do.
14	....do	George H. Lloyd	....do	Do.
14	Wrought iron	Sherburne & Co	....do	Do.
22	Pig iron	Whittier Machine Co	South Boston	Do.
27	Adhesion of nails	W. E. Trufant	Whitman	Do.
28	....do	....do	....do	Do.
28	Wrought iron	G. W. & F. Smith	Boston	Do.
29	....do	....do	....do	Do.
29	Steel bars	E. D. Leavitt, jr	Cambridgeport	Do.
1888.				
Jan. 11	Adhesion of nails	W. E. Trufant	Whitman	Do.
12	Steel plate	George H. Lloyd	Boston	Do.
17	Wrought-iron plate	Standard Cattle Co	Ames	Nebr.
17	Steel plate	Hartford Steam-Boiler Inspection and Insurance Co.	Boston	Mass.
17	Stay ends and joints	H. S. Robinson	....do	Do.
18	....do	....do	....do	Do.

PRIVATE TESTS—Continued.

Date.	Material.	For whom tested.		
		Name.	City.	State.
1888.				
Jan. 18	Welded bars	Boston Bridge Works	Boston	Mass.
18	Limestone	G. W. White	New York	N. Y.
19	....do	....do	....do	Do.
19	Marble	Vermont Marble Co	Proctor	Vt.
21	Truss	Harrison Loring	South Boston	Mass.
Feb. 6	Steel plate	George H. Lloyd	Boston	Do.
6	....do	Houdlette & Dunnels	....do	Do.
7	Paving block	H. Gore & Co	....do	Do.
8	....do	....do	....do	Do.
8	Marble	Vermont Marble Co	Proctor	Vt.
8	Limestone	G. W. White	New York	N. Y.
8	Axle journal	H. Hanson	Boston	Mass.
9	Steel plate and links	Harrison Loring	South Boston	Do.
14	Hangers	Boston Bridge Works	Boston	Do.
14	Pig-iron	E. P. Cutler & Co	....do	Do.
23	Cast-iron	A. J. Gustine	....do	Do.
Mar. 6	Wrought-iron hooks	E. Kendall & Sons	Cambridgeport	Do.
6	Steel plate	Rhode Island Locomotive Works.	Providence	R. I.
6	Granite	T. M. Tobin	Swanton	Vt.
9	Wire rope	General E. W. Serrell	New York	N. Y.
10	....do	....do	....do	Do.
12	....do	....do	....do	Do.
13	....do	....do	....do	Do.
16	....do	....do	....do	Do.
17	....do	....do	....do	Do.
19	Steel wires	....do	....do	Do.
20	I-beams	Page, Newell & Co	Boston	Mass.
20	Marble	Vermont Marble Co	Proctor	Vt.
26	Wooden posts	Jackson Co	Nashua	N. H.
27	....do	....do	....do	Do.
28	....do	....do	....do	Do.
29	Cast-iron yokes	West End Street Rwy. Co	Boston	Mass.
30	....do	....do	....do	Do.
Apr. 4	Pig-iron	Katahdin Charcoal Iron Co	Bangor	Me.
4	Steel cylinder	Providence Cylinder Co	Providence	R. I.
4	Granite	Emery & Preble	East Boston	Mass.
14	Cast-iron	J. Souther & Co	Boston	Do.
16	Wrought-iron plate	Hartford Steam-Boiler I. and Ins. Co.	....do	Do.
20	Cast-iron yokes	West End Street Rwy. Co	....do	Do.
21	Wire rope	General E. W. Serrell	New York	N. Y.
23	....do	....do	....do	Do.
May 4	Cast-iron yokes	West End Street Rwy. Co	Boston	Mass.
5	Steel plate	Charles E. Hyde	Bath	Me.
5	....do	George H. Lloyd	Boston	Mass.
5	Copper wire	American Bell Telephone Co.	....do	Do.
5	Cast-iron	E. P. Cutler & Co	....do	Do.
5	Cast-steel	Erie Basin Iron Works	New York	N. Y.
7	Steel	New York and New England Railroad Co.	Boston	Mass.
7	Electrically welded wires	General E. W. Serrell	New York	N. Y.
7	Wire rope	....do	....do	Do.
8	....do	E. D. Leavitt, jr	Cambridgeport	Mass.
9	....do	....do	....do	Do.
10	....do	....do	....do	Do.
12	Bronze	National Sulphite Boiler and Fiber Co.	Boston	Do.
15	Wire	Williams Wire Machine Co.	Taunton	Do.
16	Cast-iron yokes	West End Street Rwy. Co.	Boston	Do.
21	Steel plate	New York and New England Railroad Co.	....do	Do.
26	Wrought-iron plate	P. M. Blake	Hyde Park	Do.
June 4	Cast-iron	Erie Basin Iron Works	New York	N. Y.
4	Turn buckles	Rhode Island Tool Co	Providence	R. I.
6	Steel truss	Harrison Loring	South Boston	Mass.
7	Wire rope	General E. W. Serrell	New York	N. Y.
8	....do	....do	....do	Do.
14	Steel plate	E. D. Leavitt, jr	Cambridgeport	Mass.
15	....do	....do	....do	Do.
16	....do	....do	....do	Do.
18	....do	....do	....do	Do.
19	....do	....do	....do	Do.
20	....do	....do	....do	Do.
23	Cast-iron	South Boston Iron Works	South Boston	Do.
26	Steel	Nashua Iron and Steel Co.	Boston	Do.
27	Granite cube	Norcross Bros	....do	Do.

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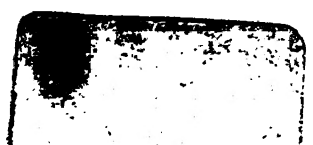

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